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INDUSTRIALIZATION AS A VITAL FACTOR FOR ADVANCING AGRICULTURAL DEVELOPMENT [1]

I feel highly honored at this opportunity to join with you in this anniversary dedication of your loyalty to democracy. For today we are gathered here to derive inspiration from the historic event which took place over three decades back when the entire faculty, student, and personnel population of this illustrious college enlisted as a body in the Philippine National Guard to fight under the U. S. flag in the first world war to save democracy. This grand and noble spirit of loyalty to democracy which you manifested in time of war, and which our people as a whole displayed so splendidly in the second world war, must be brought forth again, with the same measure of devotion and dedication during these momentous days.

For after a second world war which had to be fought for the same high purpose, we find that democracy has yet to win throughout the world. Two world wars have made us realize that democracy's hope lies not in war but in peace. The first world war vanquished the Kaiser, only to raise a Mussolini, a Hitler, and a Tojo. They were vanquished in the second world war only to leave a Stalin again contesting democracy. A third world war might destroy Stalin only to raise a more sinister anti-democratic force anywhere in the world. Thus, the delicate task of the United Nations and of the United States today is to save the world from war without losing democracy by default.

. . . . . .

A young and independent thinker has provided us with a very illuminating exposition of the role that the Philippines must play in the present world events, having regard for our roots in history, our religion and our culture. Leon Ma. Guerrero, in a recent speech before the Rotary Club discussing Asian nationalism and communism, gives an incisive presentation of our responsibility to sustain and enrich democracy in our land and, at the same time, to advance freedom and democracy in our part of the world.

It is the purpose of my speech today to start from where he ends in his speech, and, for this reason, allow me to quote from his talk the following paragraphs:

> "We shall have to find and take our place, not in the Asian continental community, but in a precarious and artificial organization of outspoken and committed American allies, the advance outposts of American power in the western Pacific, from Japan and South Korea, if there survives

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[1] Miscellaneous Contribution No. 24. Excerpts from speech delivered by the Honorable Salvador Araneta, Administrator of Economic Coordination, on Loyalty Day at the U. P. College of Agriculture, Los Baños, Laguna, October 10, 1951.

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a South Korea, through Taiwan, to Australia and New Zealand, having in common nothing but reliance on the protection and generosity of America.

"But even from this position, I think we can do a great service to Asian nationalism and the cause in which we believe. We can serve as a true bridge between east and west. We can give to Asia an example and a model of *self-controlled nationalism.*

"Let us, for our part, prove that nationalism can be self-controlled by a sense of responsibility for the common fate of humanity. Let us show that east and west can meet and work together to their mutual advantage; that the acceptance of western economic assistance need not mean second colonization; and that an alliance with the west for mutual defense does not necessarily mean enlistment in a counter-attack on Asian independence.

"Let us, above all, prove by an active promotion of social justice in our country that the peasants and the workers of Asia, the dispossessed of the ages, can achieve economic security, land and a living wage, without sacrifice of political rights, and that Asia need not, any more than America or Europe, make the inhuman choice between liberty and equality.

"There is a providence that shapes the destinies of nations, and when it decreed that our people should have the blessed fortune of winning our freedom in friendship, without conspiracy and revolution, in a land of abundance, running with opportunity and contentment, it also, I believe, placed upon us a duty of conscience to be the light of Asia, to sweeten grievances, allay suspicions, raise new hopes by our example, and in the world's night of fear and hatred to illumine for the weary and bewildered peoples of Asia the way to human brotherhood."

Here we have the historian and philosopher, proposing a role and a national pursuit and aspiration fired with the flame of a spiritual ideal for our country.

. . . . . .

The pillars of our national destiny have been set up by our great President Elpidio Quirino—and they are contained in the basic policies that he has formulated— total economic mobilization—with due protection of the local producer as a major cornerstone; a full-scale campaign for peace and order with free land and assistance for the surrendered Huks as another major cornerstone; a sound foreign policy with mutual assistance with the U. S. and all-out friendship for our two former motherlands as a third major cornerstone. Thus, the proper bearings of the ship of state have been set for the nation to attain its national destiny.

But, so far, I am afraid only the cornerstone and the pillars have been laid. For six years after the cessation of hostilities and five years after independence, we are told that the physical volume of our production is only 97% of pre-war even when our population

has increased by 27%. But the production figures are those for 1950, and I believe they do not include thousands of small scattered production units that are not recorded. But, statistics aside, the low standard of living of our masses is well apparent.

. . . . . .

In the field of agriculture, the constant and recurrent rice shortage constitutes a challenge to our capacity for organization and achievement. . . . . the said problem would easily be solved with the restoration of peace and order. And with the efforts now exerted by the government, to some extent, with ECA help, in the near future we might even have an overproduction in rice. To help in the solution of the rice problem, more than two years ago the government took bold measures with the creation of the Rice and Corn Production Administration (RCPA). Fifteen million pesos were invested by the government in the feverish attempt to produce rice in a mechanized way in three different projects, one in Cotabato, another in Bukidnon, and another in Palawan. The first crop was a disappointment, but fortunately the Cotabato and Bukidnon projects were doggedly and efficiently continued by the Land Settlement and Development Corporation (LASEDECO), and the loss of ₱824,183.91 (including interests due to the Central Bank of ₱207,183), which the projects suffered during the first crop year, will be almost recovered in this second crop year, with an expected production of 132,000 cavanes of palay (at ₱11 per cavan, LASEDECO expects a gross income of ₱1,452,000 against a cost of ₱689,000, or ₱5.20 per cavan, thus giving a profit of ₱763,000). The lessons that we can derive from this government venture in large-scale agriculture are the following:

1. That mechanized farming can be undertaken for rice production in the Philippines; and

2. That in farming, you are bound to commit mistakes in the first year of operations, as you have to contend with many factors not easily discernible except through experience, specially in newly opened areas where you have to experiment on suitable crops and planting seasons.

At this point, it is noteworthy to mention the fact that the farm machinery pools of the AMEC and the RCPA were able to put under cultivation 26,299 hectares, which is indeed a significant contribution of the government in our agricultural rehabilitation.

We are often reminded that ours being essentially an agricultural country, we should concentrate on agricultural production. Indeed we should do everything to increase agricultural production, multiply our productivity many times over. But in so doing, we should underscore no less the urgency of industrialization as a vital factor for advancing our agricultural development.

For agriculture cannot advance in the sector of production without chemical fertilizers and agricultural machineries to increase the

yield per hectare of our depleted lands and to increase the per capita efficiency and production of the farmer.

Agriculture cannot advance in the field of utilization without driers or canning and other processing plants to enhance the keeping value of the products, to multiply their uses and value, and to facilitate their marketing.

And in the same sector, we must look forward to the utilization of the agricultural waste products from which we could increase the value of our national production by hundreds of millions with the manufacture of pulp, rayon, plastics, and wallboard.

In the sector of marketing, we need refrigerated cars and ships to transport fresh agricultural products and a score of industries to provide the necessary markets for increased agricultural production.

To give just two specific examples of how industry enhances agriculture, we have only to think of the processing of corn and soybeans, which have provided a great variety of industries in the United States. In the Philippines, we do not have a single processing plant for corn and only one small processing plant for soybeans. Both the agricultural and the industrial phases must be synchronized. One cannot precede the other on a large scale. All these things that I have mentioned which agriculture needs for advancement are definitely industrial operations. It is time, therefore, for us to realize that any real progress in agricultural development can be obtained only through a parallel advance in industrial development.

But aside from the fact that our industrial backwardness constitutes a roadblock for a more speedy progress of our agriculture, I want to make the bold statement that it is easier to industrialize the Philippines than to modernize and increase substantially our agricultural production. And the reasons are simple and easy to appreciate if we would only ponder the following facts. To modernize our agriculture, we have to contend with hundreds of thousands of farmers, big and small, not only to teach them the modern ways of farming which you learn in this college, but also to apply these new methods to actual and differing conditions—a job which is not so easy to accomplish for I am one of those who believe that the art and science of farming is one of the most difficult jobs that there is today. On top of all of these, there is the big problem of making it possible for these small farmers to finance the modern ways of farming that have to be introduced in their farms.

It is not generally realized that it is easier to establish a new industry in the Philippines to cater to the local needs of our population, granted the necessary protection, than to organize and establish a new farm project, especially if you are introducing a new crop in a given locality. Foreign know-how and an entire industrial plant up to the last key may be purchased from any reputable engineering or manufacturing firm in the United States, and you can be sure that you are getting the latest of equipment and the latest

in know-how. This service you cannot obtain in an agricultural project. Even the best foreign agricultural expert would have to learn of our climate, of our different soils, and of many other natural factors that have to be considered in an agricultural project. The first American sugar project undertaken by Hawaiian capital, that had the know-how and had the whole Philippines to choose from for its field of operations, committed the big mistake of establishing its sugar plantations in Mindoro, and the project has never succeeded and has always been a white elephant. Such a major blunder is only understandable in agricultural projects and does not usually take place in a purely industrial pursuit. Furthermore, to attain real progress in agriculture, we have first to attain the solution of age-old problems that are sucking the vitality of agriculture, especially of the small farmer.

We know that one of the major obstacles to the progress of agriculture today in the Philippines is the very high cost of agricultural land in the developed areas and the difficulty of acquiring land in the underdeveloped areas. Even in the developed areas, we need more feeder roads to make our agricultural produce more accessible to the market, and in the underdeveloped areas, we need to start in a big way the building and repair of roads that have been suspended and neglected since the war; and we have to amend our public land law to reduce to the minimum the speculation in public lands. President Truman could boast in his speech in San Francisco that during the American occupation of Japan, Japan has made a remarkable progress in land reform to the extent that today about 90% of all cultivated land belongs to those who work on it, as compared to less than 50% in 1945. In the Philippines up to now, we have been timid in the attack of this problem even though the same is one of the age-old evils in our social economy pointed out in the Bell Report.

Again, President Truman, in the same speech, assures us that Japan, during the last years, has greatly expanded its cooperative farms, while in the Philippines, we have not been able to accomplish a substantial progress along this line. We know that marketing cooperatives for our agricultural produce are essential, if we are to enable our producers to obtain a greater share of the price of their produce, and that to insure the stability and success of these marketing cooperatives, they have to be organized around warehouses, elevators and processing plants, and they have to be amply financed through a Central Bank for cooperatives—an instrumentality which has proved its worth in Japan and in the United States.

We need also to solve the problem of rural credit—another of the evils pointed out in the Bell Report—which can only be solved with the fullest degree of drive and boldness.

And lastly, we have to solve in a big and quick way the dearth of technical men in agriculture.

Your Alma Mater, which up to recently was the only agricultural college in the Philippines, has turned out, I understand, not more than 1,751 graduates in all its history of more than 40 years. Indeed it is in the agricultural field that our supply of technical men is most scarce and it is in this field that the demand is greatest. While agriculture is the largest avocation in the Philippines, bigger than all avocations put together, we have only a student population of not more than 1,600 students in the three agricultural colleges at present existing in the Philippines, as against 1,536 students of engineering enrolled in the schools of engineering that we have in the Philippines. And the reason is simple. Engineering may be taken by self-supporting students at night, but not agriculture. A big and generous program of scholarships to agricultural students is essential if we wish to increase and attract the best types of students to the agricultural schools and colleges in the Philippines. This is a "must" in any plan to bring about a major agricultural development in our country.

And finally our revitalized agriculture cannot be achieved unless we give to agriculture a greater share of our national budget, from about ¼ of 1%, which is the share alloted to it at present, to a share of not less than 2% to begin with.

Of late, it is gratifying to note that even the American community and, most especially, the official American view have come to realize the important role which our industrial development has to play in the promotion of our agriculture. But still we hear now and then scattered American voices showing skepticism of our plans of industrialization. Thus, we find in a recent article written by an American, well respected in our community, the following remarks: "Industrialization came about in the United States as the people were released from seeking subsistence from the soil. It is unlikely that it can be successfully enforced or imposed from the top down. Industrialization will only become economically advantageous to the Filipino people as a natural consequence of an improved agricultural production and development of the basic resources of the country." Our friend forgets that his company in the United States was manufacturing and selling agricultural implements and machineries to the American farmers many years before the public lands of the West were entirely occupied and developed by American farmers. He forgets that the East was already an industrial empire many years before the West and the South were fully agriculturally developed. It is a misconception to believe that in the Philippines we are envisioning an industrialization program forced, or imposed, from the top down. But we know that our industrialization plans will come to naught unless it is sponsored and protected from the top, and we are confident that the implementation will come sidewise when American manufacturers realize that they can no longer sell their products freely in the Philippines and are forced to duplicate their factories in our land, to cater to the needs of 20 million people, a market which is bound to become more

important every year as our standard of living increases. To consider that only agriculture provides the basic resources of the country is to forget our big natural resources in water power and minerals, including the basic ones, so necessary for the establishment of the basic industries. Indeed, today, we are no longer envisioning a half-hearted industrial development, mostly made up of light industries. Our industrial development must be based on the full exploitation of our iron, manganese, chrome, coal, and other mineral resources coupled with cheap hydro-electric power, for we envision that we must have in the Philippines the major basic and chemical industries. Anything less would not do justice to the program of total economic mobilization launched by our President and to the great natural resources that we have been endowed with by Providence.

. . . . . .

And in the implementation of this present total economic mobilization program, you can readily see that the alumni and future graduates of this, your Alma Mater, have a very important role to play. Today, it is only to be regretted that we do not have more Los Baños graduates whom we could enlist as technicians in our government corporations and as professors in the Araneta Institute of Agriculture. Let me avail of this opportunity to make public my great admiration for this, your college, as a result of the contacts that I have had with your alumni. In the LASEDECO, I am happy to have as collaborators many of your graduates, starting from the General Manager of that corporation and including the young graduates that are so efficiently managing the large-scale rice mechanization project in Bukidnon. Furthermore, I wish to acknowledge the wonderful cooperation extended by this college to the work of the LASEDECO, especially in matters of research and advice to the management. Indeed, the country can be proud of the accomplishments of the products of this college. Your fame is such that even some of our neighboring countries send their native sons to you for agricultural education.

Although I have championed the cause of Philippine industrialization for the past years, yet I do realize that a healthy and more ample Philippine agricultural development must receive the full attention of our government and our people. It is for this reason that we in our family have organized the Araneta Institute of Agriculture and have established it right at the portals of our two cities, Manila and Quezon, precisely to attract the city folks back to the land. During the first world war, the whole population of this compus enlisted as a body to fight in the battlefields under the American flag. Today, your appointed role is to foster democracy in the ways of peace, production, and abundance.

And let these parting words be addressed to the student body of Los Baños. I trust you will always remain close to the land, finding joy in being co-partners with God in the creation of life destined to become food for our people. I wish for you a new vision of things

to accomplish, a new vigor of youthful enthusiasm, a new love for the land and the noble profession that you have embraced.

By and large, our farms are still primitively and inefficiently operated and while I have pointed out the great difficulties and the great obstacles in the modernization of our farms, the job is not exceeding our capacity, but indeed a great challenge to the faculty, student body, and the graduates of this institution. For its solution we need plenty of first-rate agricultural scientists, agricultural engineers, agricultural administrators, agricultural technicians, and agricultural economists. The best minds and hearts of our youth should be attracted to the agricultural profession, and we shall soon transform this beloved land of ours into a real democracy, a forceful influence for peace and a light of Asia.

ABACÁ FARMING IN CAMARINES SUR, ALBAY, AND SORSOGON [1]

N. B. TABLANTE

WITH THREE TEXT FIGURES

For over a century now, the Philippines has supplied the world with abacá for cordage manufacture. Before the outbreak of World War II, Manila hemp ranked third among the major exports of the Philippines, but at present, it ranks second, outvalued only by copra. During the first half of 1948, 363,448 bales of unmanufactured abacá, valued at ₱35,280,130 and representing more than 10 per cent of the total value of exportation, were shipped to various countries of the world. The United States got more than 50 per cent of it. Abacá exports in 1951 amounted to only ₱35,001,210. The 1939 census showed that 291,530.8 hectares of land in the Philippines were planted to abacá and produced 144,130,155 kilograms of fiber. Of the total area, 28 per cent was in Davao, 17 per cent, in Albay, and 15 per cent, in Sorsogon. Davao had an average production of from 10 to 20 piculs a hectare, whereas the Bicol provinces averaged only from four to six piculs to a hectare.

The foregoing data prove that abacá is so important to the economy of the Philippines that the problems of the industry would be a good subject for research. This survey of the various economic problems connected with the abacá industry in Camarines Sur, Albay, and Sorsogon, of the Bicol region, was made so as to have a basis for formulating a program of improvement for the industry.

METHOD OF STUDY

A preliminary survey was conducted in Sorsogon to determine the applicability of the questionnaire previously prepared in the Department of Agricultural Economics to the particular need of the time and the place. The original guide sheets were found to be rather long and too detailed for the farmer to comprehend easily; hence, they were revised without eliminating the points essential for the accomplishment of the objectives of the study. From the early part of April to the latter part of May, 1948, several towns whose major product is abacá were visited, and abacá planters, strippers, hemp buyers, employees of the National Abaca and Other Fibers Corporation (NAFCO) branches, and plantation foremen were

[1] Central Experiment Station Contribution No. 1627. The collection of the data presented in this paper was made possible through a grant-in-aid by the National Research Council of the Philippines, for which due acknowledgment is hereby made. Read by the writer before the Los Baños Biological Club on October 29, 1948.

interviewed. By combining the information gathered from these people with those gained from personal observation of the plantations, a good picture of abacá farming in the three Bicol provinces was obtained.

ABACA FARMING IN THE BICOL REGION

Farm management. In general, abacá plantations in the three provinces are very poorly organized. Once the abacá plants are planted, very little attention, if any, is given them. The little cleaning done previous to the cutting down of the stalks is to provide a convenient passage for the harvester rather than a good farm practice.

In plantations of 15 to 80 hectares, the practice is to let a foreman ("cabo") take care of the plantation and of the stripping operations. This foreman stays in the plantation with his family in quarters provided by the landowner. During the stripping season, he looks after the preparation of the fiber and selects the men who will strip for him on a 50-50 share basis. A foreman ordinarily gets from one-fifth to one-fourth of the landowner's share in the sale of the fiber, but in a few instances, he is given a flat rate of commission, such as ten per cent of the total harvest, or from two to five centavos for every kilogram of dry fiber produced. Granting an average production of five piculs a hectare and an average price of fifty centavos a kilogram of the average grade (J_2), a foreman gets only from about ₱15 to ₱20 for every hectare a year.

Only one out of ten abacá planters interviewed kept reliable records. The planters never bother to keep track of the amount of labor they use or the disbursements they make. Sometimes they note down the sum of money they receive after the fiber has been marketed or the commodities their foreman or stripper gets from them as advance debts. The owners stay in the town where their plantations are located or in places far from their holdings and wait for the returns from their foremen. It is unusual for most of these landowners to visit their plantations; for those who live near their lands, visits once or twice a week are frequent enough. In very rare cases, the owner himself supervises the work on the farm and instructs the strippers on the proper handling of the fiber. No stripping machines were installed in the plantations, except for one in the NAFCO model farm in Mauraro, Guinobatan, Albay. About six hand-strippers handle the job of stripping the abacá gathered from one hectare.

The stripper belongs to a class of workers in the abacá industry which suffers very much because of inadequate income. He performs the strenuous task of preparing the raw fiber for the market and gets one-half of the total proceeds from whatever quantity of fiber he can strip. His average capital ranges from ₱14, if he does not own the house where he lives and the land from where he gets the abacá he strips, to over ₱3,000, if the dwelling and land are his. Very few strippers have livestock, possibly because of unavailability

of feed. If a stripper does own livestock, it is composed mostly of carabaos and poultry. Such a situation exists in Sorsogon, Albay, and Camarines Sur. The total investment of the average stripper is distributed as follows: one-fifth to one-fourth for livestock, including work animals; one-half for buildings, including dwelling; and about one-fourth for tools and minor equipment. If he owns the land, the proportion varies from one-half to about three-fourths or more of the total investment. He works either independently, wherever mature abacá is available, or for a particular landowner in a plantation, on a parcel of about one to two hectares.

Harvesting. Harvesting is done every six months. Ordinarily, the stalks are ready for cutting when the plant is about to flower, but because strippers want to take advantage of the prevailing high prices of fiber, even those stalks which are still immature are felled. After the tops have been cut off, the stalks are cut close to the ground and piled in convenient places in preparation for splitting into "tuxies." Before this is done, the harvester removes the grasses and small shrubs around the plants for convenience in the selection and cutting of the stalks.

Fig. 1. Left, the "lucnit" way of preparing "tuxies" in Sorsogon; right, separation of the pulpy layer from the inner surface of the leaf sheaths in the "backnis" way of preparing "tuxies" in Albay.

Preparation of "tuxies." In Sorsogon, "tuxies" are prepared by the "lucnit" method (fig. 1, left.). The "tuxedor" assumes a sitting or half-kneeling position, with the abacá stalk directly in front of him. With a knife in his left hand, he pries loose about

one and one-half inches of the leaf sheath from the butt end of the stalk and, with a forceful jerk, pulls the "tuxy" upward with his right hand until it is completely separated from the distal end of the stalk. This method is wasteful because much fiber is lost, for the upper portion of the "tuxy" is much thinner than the lower portion.

In the province of Albay, the "tuxies" are prepared by the "baknis" method (fig. 1, right). The "baknis" method differs from the "lucnit" method in that the worker, usually a woman, is in a standing position. The leaf sheaths, layer by layer, are first removed from the trunk and piled parallel to each other with their butt ends together. The worker takes a leaf sheath at a time, lays it on the ground with the inner surface up and the butt end towards her, and sets her left foot on the butt end. She holds the upper part of the leaf sheath with her right hand, places her left hand on the inner surface facing her, and bends the leaf sheath as far down as possible without breaking it. The palm of her left hand faces outward and the thumb is up in a vertical position to prevent the leaf sheath from slipping down the forearm. She slides her left palm towards the top of the leaf sheath as she pushes it forward in a bent position with her right hand. If the leaf sheath is too long for the worker, she advances her left foot one step forward on the leaf sheath. Before taking the step forward, she replaces her left foot with her right to hold the leaf sheath in place. After thus softening the leaf sheath, she releases the upper part with her right hand and places her left hand at the back of the softened leaf sheath. The weight of the upper part of the leaf stalk causes it to spread open, and its inner pulpy part becomes distended and convex. The worker runs a sharp knife from left to right of the distended part diagonally downwards to cut the pulpy tissues. She sloughs off the entire layer of pulp with the index and middle fingers of the right hand, leaving the outer one- to two-millimeter-thick layer containing most of the strong fibers. The "tuxies" are placed one on top of the other with their butt ends together until they pile about 20 centimeters high. These piles are then hauled to the stripping shed. Care is taken to separate the "tuxies" from the inner sheaths and those from the outer ones to prevent an admixture of dark- and light-colored fibers.

Stripping. The extraction of the fiber from the "tuxies" is probably the most important phase of abacá production. Abacá, in the three Bicol provinces studied, is still stripped by hand, the "tuxies" being pulled between a knife and a block of hard wood called the tongue (fig. 2, left). The knife is held in place by a short piece of wood chiseled into a horizontal tree trunk about 15 centimeters in diameter. The sharp edge of the knife is pressed tight against the block of wood by a yoke-like piece of wood tied to the horizontal tree trunk. At the end of the wooden handle of the knife, which may be about two times longer than the steel blade, are two strings connected to levers. One of the levers pulls the handle up so that the blade will

press tightly against the block of wood. The other lever, when stepped on by the left foot of the stripper, pulls down the handle of the knife, allowing the insertion of the "tuxies." The "tuxies" are inserted with the butt ends toward the stripper. After they are spread

Fig. 2.—Left, hand-stripping of abacá fiber by pulling the "tuxies" between a serrated knife and a block of wood with a jerking motion; right, stripping abacá with the spindle-stripping machine or "hagutan" at the NAFCO model plantation in Mauraro, Guinobatan, Albay.

evenly on the block, the left foot of the stripper is removed gently from the lower lever. The upper lever pulls the handle up and the knife presses against the "tuxies." The stripper gathers up the butt end of a "tuxy," wraps it around a piece of bamboo about 3½ centimeters in diameter and 24 centimeters in length, one end of which has a node to prevent crushing, holds it firmly, and pulls the "tuxy" against the knife suddenly, exerting his weight. The hand method of extraction is wasteful because much useful unextracted fiber in the soft inner pulp of the leaf sheaths goes with the pulp as waste.

From 18 to 30 stalks, or an average of 23 stalks, are stripped in one day by a hand-stripper. From five to 30 kilos of raw fiber are extracted in one working day, depending upon the grade of fiber

produced. Of the higher grade fiber, from five to 10 kilos are stripped a day; of the coarser grades, about 20 to 30 kilos. The amount of abacá fiber stripped in one week ranges from 15 to 150 kilos, depending upon the quality of the fiber extracted and the condition of the plants in the plantation. A laborer strips an average of 55 kilos of dry fiber a week of four days of actual stripping. A stripper uses the first two days of the week for cleaning, harvesting, and preparing the "tuxies."

An improvement over the hand-stripping device is the spindle-stripping machine. The NAFCO extension service has one of these machines in its model plantation in Mauraro, Guinobatan, Albay. This stripping machine, known as the "hagutan" (fig. 2, left), is built on the same principle as the knife and block of the crude method. The machine is driven by a two-and-one-half-horsepower engine which consumes a gallon and one chupa of gasoline in eight hours of operation. The "tuxies" are pulled under the knife by a revolving pulley which utilizes the momentum of the heavy flywheel. Two men working alternately for eight hours a day meet the minimum labor requirement for operating the "hagutan." One man prepares the "tuxies" and the other runs the machine and strips the fiber. An output of one picul of dry fiber for every eight-hour working day is said to be the average with the spindle-stripper.

The following table, adopted from Santos (1947),[2] shows the comparative efficiency in fiber extraction of the spindle machine and the ordinary hand method of stripping:

	HAND-STRIPPED			SPINDLE-STRIPPED		
	Excellent	Good	Fair	Excellent	Good	Fair
Weight of "tuxies" in kilos	25.5	23.3	20.2	262.5	209.0	197.5
Weight of dry fiber in kilos	2.29	2.32	2.21	24.7	20.2	24.1
Percentage of fiber extracted	9.0	9.9	10.9	9.4	9.7	12.2

Based on the relative percentage of fiber extracted, the above table shows that stripping by machine is more efficient than by hand. The stripping machine also facilitates grading because it turns out fiber uniform in quality. Furthermore, it operates continuously and produces a larger volume of output in a given unit of time, thereby giving the worker a higher daily return. This machine encourages the planting of taller abacá varieties because it cannot use short "tuxies" effectively. About four to five good "tuxedors" are needed to prepare enough "tuxies" to feed the machine in one day.

Drying. Abacá should be thoroughly dry before it is marketed. The stripper hangs the fibers on abacá strings in the yard (fig. 3, left) to dry in the sun. A half day of sunlight is sufficient to dry

[2] SANTOS, JOSE B. 1947. The rationalization of fiber production in the Philippines. The Evening Herald 2 (212): 6–9.

the fiber. In large plantations, sheds are provided where the strippers take their fiber for air-drying. As fiber is bought on the basis of the weight of the average grade, many strippers sell their products before they are completely dry. This lowers the grade of Philippine abacá fiber and places it on a low standard in foreign markets, especially when care is not exercised in shipping the products. Where there is a drying shed, the dry fibers may be stored before they are

Fig. 3.—Left, drying abacá fibers by spreading them out on lines or poles in the open; right, transporting dry abacá fiber from remote barrios by carabao

marketed, but in most instances, they are taken immediately after drying to the buyers who dictate the price.

Marketing. The marketing of abacá fiber presents a problem far more serious than the improvement of abacá production itself. It has to do with the getting of better prices by the farmers and with the nationalization of the trade. Between the farmer and the ultimate exporter of unmanufactured abacá are several middlemen who widen the marketing margin and ultimately lower the proportion of the differential accruing to the farmer.

Abacá fiber is marketed by the stripper once a week, usually on Saturday afternoons or on Sundays. For producers who live far from the local buyers, the product is transported from the farm either by man, by carabao (fig. 3, right), or by truck, if the place is

near the highway. In a few cases, the large buyers send their trucks to collect the produce of their patrons. Generally, the local buyer is the barrio lieutenant or a storeowner who acts as a subagent for other subagents or for the agent who has his place of business in the town or in the provincial capital.

In this connection, the "sacada", or advance-debt, system is worthy of mention. By this practice, the farmer gets commodities or money from the local buyer of hemp in anticipation of the receipts he will get from the sale of the abacá fiber, with the consequence that his prospective income has already been spent long before the product is actually sold. He promises to deliver his fiber to the storeowner who dictates the price, and because the poor farmer has no other alternative, he ordinarily gets a low price for his product. When the weekend market day comes, he is able to take home a very small sum of money or merchandise which is obtained on account, thus increasing proportionally the burden of credit. The "sacada" system is very widely practiced by the small abacá farmers of the Bicol provinces studied. The Chinese merchants profit very much from it.

The fiber products are sold either to Chinese or to the NAFCO agents, depending on who offers a higher price. Usually, the former outbids the latter because the NAFCO does not have much funds. In addition, the Chinese middlemen are more liberal in their credit policies, thereby inducing the small farmer to sell his products to their agents and subagents who are widely scattered in the producing areas. The farmer delivers the unclassified fiber to his buyer and receives the average price for what the latter approximates as the grade of the assorted fiber. Because the seller has no definite knowledge of the composite grades of his products, he accepts the price the buyer dictates, which is always less than the actual average price for that particular grade. During the time of this survey, the prevailing average price paid to the farmer for the higher grades (E, S_2, S_3, I, J, G) was 55 to 75 centavos a kilogram, and for the fair or coarser grades (J_2, H, K, L, M, etc.), from 35 to 50 centavos a kilogram. On the average, all the grades taken together bring about 45 centavos a kilogram of dry fiber, which should be at least 10 centavos lower than what the wholesale buyers pay. After the fiber has been reclassified and graded accordingly, the agents and subagents derive the pecuniary benefits resulting from the accumulation of the higher grades of fiber.

Baling and grading. The Fiber Inspection Service of the Department of Agriculture and Natural Resources supervises the actual sorting, baling, and grading. Although these processes are separate from the farm operation of abacá planters, it is deemed proper to include a discussion of them here in order to complete the presentation of the problems connected with the abacá industry in general. Grading establishments which undertake the job of grading and baling fibers need to secure the necessary grading permit and pay the

fees corresponding to the class under which they fall. The classification of balers depends upon the number of bales pressed during the year. The fee varies from ₱100 for those baling less than 10,000 a year to ₱1,000 for those baling over 50,000 a year. Every bale of fiber must contain only fibers of the same kind and grade, must be perfectly dry, and must give an approximate volume of 12 cubic feet after pressing.

In accordance with the Revised Administrative Order No. 4 of the Fiber Inspection Service, a number of standard grades of hand- or spindle-stripped abacá has been designated. There are five standard grades of fiber for tagal braid and for other fine textiles and 29 for general cordage purposes (18 normal grades, 11 residual grades, and one waste grade). The primary qualities which determine the grade of fiber are tensile strength, cleaning, and color. Texture and length, while not important in determining grade, are often considered necessary in identifying the type of any grade. The normal tensile strength varies with the extent of cleaning. The relative normal tensile strength of any of the grades included in coarse cleaning is less than that of the fibers of the higher groups.

The quality of cleaning of abacá fiber is determined by the method and extent of extraction of the fiber from the leaf sheaths of the plant. If the knife has serrations of uniform width and depth and if the tension of the knife on the block is maintained uniformly, the fiber comes out of regular or uniform cleaning. There are some varieties, however, which produce naturally bold fibers and which may have fibers of excellent or good cleaning that appear to be of fair or coarse cleaning only when compared with naturally fine fibers of the same cleaning. As regards color of fiber, the variation ranges from dark brown or purple to almost white, depending on whether the fiber is extracted from the inner, middle, or outer sheaths. When properly stripped, dried, and handled, the higher normal grades are produced from the inner sheaths which are naturally whiter and softer than the middle or outer sheaths, hence the white color and comparatively softer texture and finer size of their fiber. The most common grades of fiber produced in the three Bicol provinces fall under the groups of good to coarse cleaning, more specifically, the grades ranging from J_1 to J_2.

The description of the official standard grades of abacá fiber issued by the Fiber Inspection Service applies to typical grades. In practice, however, a large quantity of marketable fiber does not accurately correspond to this description of typical characteristics. The deviations result from the use of immature or overmature stalks of the abacá plant, delay in "tuxying" the sheaths of the stalk after it has been cut, delay in stripping the fiber, improper adjustment or uneven serrations of the stripping knife, mixing of the "tuxies" of the different groups of sheaths of the abacá stalk in stripping, mixing of the fibers from different groups of sheaths in drying, delay in drying the fiber after extraction, improper handling and

storing, or prolonged storage of the fiber. One or more of these causes make the process of conditioning the fiber prior to baling and exportation an expensive item in grading establishments. This job consists of removing foreign materials, sorting the fibers into their respective colors and lengths of hank, and cutting off the dirty ends of the fiber. When different grades are mixed, their separation becomes a tedious and costly operation.

Analysis of cost and returns. The average output of a hand-stripper is 55 kilograms of dry fiber a week. At an average price of ₱0.45 a kilogram, the total gross income would be ₱24.75, one-half of which goes to the landowner as his share. The amount of ₱12.37 that the stripper receives represents the product of his six days' work, or an average of ₱2.06 a day. Any further reduction, however small, in the average price of the fiber would mean a proportionate decrease in the income of the strippers. From the plantation owner's share, the foreman receives as much as one-fifth. It can be seen that the landowner has very little left to cover interest on capital and returns for the upkeep of his plantation. He is as much affected as the stripper from the standpoint of income when a decrease in the price of hemp occurs. It must also be emphasized that the stripping season lasts, at most, two months twice a year.

The very low production of fiber in the three Bicol provinces accounts in a large measure for the correspondingly low returns to abacá producers. On an average production of six piculs to the hectare at the average price of ₱0.45 a kilogram of the coarser fiber, one hectare would give a gross return of about ₱170. The cost of labor in producing the fiber represents one-half of the selling price of abacá. To this must be added the interest for the use of capital, taxes, and cost of conserving the plantation.

The low yield of abacá in these three provinces may be due to the fact that the plantations are already very old. The soil has been continually grown to the same crop and is now badly depleted. In many plantations, the soil has never been cultivated. Another reason may be that in replacements of the missing stools or in new plantings, no selection of planting materials is done. The plants are allowed to grow without care and attention.

RECOMMENDATIONS FOR MINIMIZING THE ABACÁ PROBLEMS IN THE THREE BICOL PROVINCES

1. The low yield of abacá, presumably due to depleted soil, lack of proper care and management of plantations, and poor varieties used, may be improved by the adoption of more scientific methods of farming. Old plantations should be rejuvenated and only high-yielding varieties best adapted to the region should be planted. The Bureau of Plant Industry maintains an abacá experiment station at Guinobatan, Albay, where abacá producers may ask for information regarding the varieties to plant, proper culture and improved

methods of cultivation, and many other valuable data. Adequate care should be given the plantations, and producers and landowners should look upon their abacá farms as a regular means of livelihood. Farms should be better organized in order to place abacá farming on a more businesslike basis.

2. The high cost of production brought about by faulty and costly methods of handling and preparing the fiber for the market may be prevented by close supervision of the stripping operations. If more stripping machines of the spindle type could be used, the labor hours of abacá farmers would be more productive, for the strenuous job of fiber extraction by hand would then be replaced by the more efficient one of feeding the machine and operating it continuously. In this way, the worker can devote his extra hours to producing food crops or attending to his cultural development. Efficiency in production means a reduction of costs and, ultimately, larger returns. If abacá producers cooperate among themselves, they could provide the necessary facilities which would greatly speed up production. The extra expense that goes with resorting and reconditioning the fiber in the grading establishments could be eliminated partially or totally if producers were to attend to the minor details involved in the different steps of production.

3. The inefficient marketing system may be corrected by the cooperation of the producers. In the United States and Denmark, farmers have been forced to set up their own cooperative marketing agencies because of low returns, the prevalence of wide marketing margins, unfair treatment by middlemen, and above all, the small-scale production on their farms, which does not warrant economy of distribution. These problems are identical with those connected with the marketing of abacá in the Bicol region. The organization of cooperative associations would integrate marketing and production operations and help the producers get their just share of the price paid for their products. Through cooperation, producers can consolidate their selling force and improve their bargaining power. The need for middlemen, however, may not be entirely eliminated even by the establishment of cooperatives owned and operated by the farmer-members themselves who receive the direct benefits in the form of pecuniary savings and better services. Cooperation has a better chance of success when exercised by producers who have similar interests, who live close to each other, and who know one another.

By pooling their resources, a considerable number of farmers will be in a position to get the best of what the economic structure has to offer. The small volume of production of individual farms, when collected and marketed through a cooperative association, will be concentrated. Economy is effected because marketing costs are reduced to a minimum for a unit owing to the higher amount of the combined produce. More uniform and better-quality fiber will move through the market channels, for the association will strive to place only the best products in order that it can establish itself firmly and

obtain a favorable price for its members. Furthermore, through cooperation, farmers can acquire the necessary facilities, implements, and consumption goods at less expense than would otherwise be possible if they work singly. Also, they would be saved the trouble and expense of the advance-debt, or "sacada," system if they can secure adequate loans, from their organization or from other agencies through their cooperative association, to finance their productive operations and daily needs. Cooperation will also serve as the medium through which nationalization of the industry may be achieved, since the Chinese middlemen would be replaced by the farmers' own cooperative association.

4. The low returns to producers may be increased by improving production and marketing methods and by reducing production costs in the manner suggested in number 3. Another ways is to grow food crops that will supplement the income derived from abacá production.

5. The existence of very many grades of abacá may be corrected by consolidating those grades which practically overlap in their specifications, by minimizing errors and confusion attendant to classification, and by placing only well-trained personnel in fiber inspection agencies in the heart of abacá regions, disregarding political inclinations and influences in making the choice.

6. The instability of specialized abacá production may be removed by maintaining a high level of good quality product. Production should be undertaken as efficiently as possible, which means that the cost must be at a minimum and profits continuously at a maximum. Slight diversification will go a long way if prices of abacá should go down. Industrialization must be encouraged and abacá wastes utilized. New and better uses of abacá fiber for home industries should be sought. There is a good market for abacá products, such as slippers, bags, hats, twine, sacks, rugs, and other articles, both in domestic and foreign markets. The value of these exports will help very much in putting the abacá industry in a more secure position.

SUMMARY OF CONCLUSIONS

1. Camarines Sur, Albay, and Sorsogon are among the old abacá-farming regions. At the beginning, crude methods of production were adopted, and until the present day, the practices have persisted with very little improvement. The abacá plantations have deteriorated and unless something is done to rejuvenate and rehabilitate the industry, the point of diminishing returns will be reached and further production will become unprofitable.

2. The abacá industry in these provinces suffered very much from the destruction wrought by the last war. Farms were neglected, and abacá plants were cut down and replaced by food crops. Before the farms could recover, the catastrophe was followed by several destructive typhoons.

3. Like most Filipino farmers, the abacá producers do not get a decent living from their crops. The most they can do is to hope for better prices since only then are their returns apparently high. Yet there is very little that individual farmers can do about prices, since world market forces have to be considered. Every effort should be made to maintain the position of abacá in international trade as a major export product of the Philippines. Planters can help much in this respect if they strive to improve the quality of their fiber. Other markets should be sought and those already existing must be expanded. The government should help the producers in every possible way, such as providing adequate finances, anticipating market demands, disseminating market information, and discouraging inefficient production.

4. If unscientific methods of production and marketing persist, production costs will continue to be high, quality of the product will continue to be low, and competition with other countries will eventually break down the economic mechanism of the abacá industry. If the trend should lead to modern, scientific methods, the prosperity of the abacá industry would be assured, and any increase in Manila hemp production would be absorbed by the world market. For the present and the immediate future, there is still plenty of room for improvement.

THE INFLUENCE OF VARYING AMOUNTS OF WATER ON SURFACE-IRRIGATED LETTUCE FERTILIZED WITH AMMONIUM SULFATE [1]

ANDRES P. AGLIBUT, LEON G. GONZALEZ, and AMADO C. GARCIA

WITH TWO TEXT FIGURES

The fine eating quality of lettuce (*Lactuca sativa* Linn.) depends, to a large extent, on fast growth, which in turn depends on sufficient soil moisture, right temperature, and proper soil conditions. Hence, this study to determine the influence of varying amounts of water on the growth and development of lettuce plants in Lipa clay loam fertilized with ammonium sulfate was conducted in the experimental yard of the Department of Agricultural Botany and in the Department of Agricultural Engineering from June, 1950, to March, 1951.

MATERIALS AND METHODS

About 15 to 18 centimeters of the surface of Lipa clay loam vegetated with a vigorous growth of *Calopogonium muconoides* Desv., enough for three plantings, was collected, air-dried, thoroughly pulverized, mixed, sifted in a 7-millimeter sieve, and stored in a concrete tank behind the Agricultural Engineering building. Analysis of a composite sample in the Department of Soils showed a pH value of 6.2 and a water-holding capacity of 48.2 per cent on the air-dry basis and 53.9 per cent on the oven-dry basis. On the same composite sample, two tests made in the Central Experiment Station Chemical Laboratory, Department of Agricultural Chemistry, showed an average of 0.98 per cent K_2O, 0.15 per cent P_2O_5, and 0.21 per cent nitrogen. The moisture content was 12.13 per cent (air-dry basis). A layer of pea-sized gravel was placed at the bottom of fifty 1-gallon tin cans to prevent future clogging of the drainage holes and then equal weights of the prepared soil were put in.

Seedlings of the Early Curled Simpson nonheading variety of lettuce of uniform age, size, and vigor were planted in each can. Each planting was made up of five lots of ten plants each. The plants were assigned at random to the different lots and placed in the troughs. The same amount of water was applied to each can during transplanting. Irrigation treatments began a day after transplanting.

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The plants in all the lots, except lot I, were fertilized with ammonium sulfate twice, 2 grams to a plant ten days after transplanting and 3 grams seven days later. The desired amount of fertilizer was measured in calibrated bamboo tubes and spread evenly in a ring around the base of each plant. The ring was covered thoroughly to prevent the fertilizer from coming in contact with the leaves and base of the plants and from leaching around the sides of the cans.

Each plant in lot I received an amount of water equivalent to 30 per cent of the water-holding capacity (air-dry basis) of the soil in each can. Based on the soil content of each can of 3.8 kilograms and the water-holding capacity of the soil of 48.2 per cent, the amount of water equivalent to 30 per cent of the water-holding capacity was 0.55 kilogram, or 0.55 liter. Lot II received 10 per cent, or 0.18 liter to a plant; lot III, 20 per cent, or 0.37 liter; lot IV, 30 per cent, or 0.55 liter; and lot V, 40 per cent, or 0.73 liter.

Calibrated tin cans were used for applying water slowly around the base of each plant. Loss of water due to seepage through the sides of the container was prevented by depressing the soil at the base of the plant and compacting it against the sides of the container. The total amount of water applied and the seasonal precipitation during the three plantings of lettuce are tabulated below:

Lot No.[a]	*Water-holding capacity*[b]	*Amount of water used*	*Frequency*	*Rainfall*	*Distribution*
	per cent	*cm.*	*days*	*mm.*	*days*
FIRST PLANTING					
I	30	59.2	23	183.3	17
II	10	19.7	23	183.3	17
III	20	39.4	23	183.3	17
IV	30	59.2	23	183.3	17
V	40	79.4	23	183.3	17
SECOND PLANTING					
I	30	61.7	24	134.4	20
II	10	20.6	24	134.4	20
III	20	41.2	24	134.4	20
IV	30	61.7	24	134.4	20
V	40	82.3	24	134.4	20
THIRD PLANTING					
I	30	69.5	27	137.6	23
II	10	23.2	27	137.6	23
III	20	46.3	27	137.6	23
IV	30	69.5	27	137.6	23
V	40	92.6	27	137.6	23

[a] Lot I, unfertilized; all the other lots received 5 grams of ammonium sulfate to a culture.

[b] Daily rate of irrigation unless it rained.

All the plants were cultivated once a week and watered every afternoon except on rainy days and when the soil was considered sufficiently moist.

The rate of growth of the plants, the external appearance of vigor, color, and susceptibility to insect pests and diseases were observed.

The plants were harvested when they had attained the right size for table use, that is, when they were about to flower. The appearance of the plants in all the lots at harvest time is shown in figure 1. The plants were cut at the base with a sharp knife and im-

Fig. 1.—The appearance of the lettuce plants in the unfertilized (number 1) and fertilized lots (numbers 2 to 5) 42 days after transplanting. The percentages shown here refer to the amount of water based on the water-holding capacity of the soil used (air-dry basis).

mediately weighed. The roots were washed slowly to remove the soil particles. The excess water after washing was allowed to dry before the roots were weighed and measured for length.

Three identical plantings were made at intervals of 16 days between the first and second plantings and 14 days between the second and third. Three sets of seedlings of the same variety, age, size, and apparently of the same stand were used in the three plantings.

The weather observations during the period of each planting, furnished by the local weather observation station which was approximately 80 meters from the cultures, are tabulated below:

PLANTING	AVERAGE TEMPERATURE		AVERAGE RELATIVE HUMIDITY	RAINFALL		CLOUDS TOTAL AMOUNT	VISIBILITY
	Minimum	Maximum		Total	Distribution		
	°C.	°C.	*per cent*	*mm.*	*days*		
First	21.9	28.3	83.9	183.3	17	3–10	7–9
Second	21.0	27.4	80.7	134.4	20	3–10	5–9
Third	21.7	27.6	80.3	137.6	23	4–10	5–9

RESULTS AND DISCUSSION

First planting

Growth and maturity of plants. Uniform but slow growth of the plants in each lot was observed before the application of fertilizer. The frequent rainfall during the period was apparently more than the amount required by the new transplants. Ten days after transplanting, the plants recovered. Signs of accelerated growth became evident a week after the first application of fertilizer at the rate of 2 grams to each plant. The second fertilization of 3 grams to a plant was given on November 24, 1950, a week after the first application. Two weeks later, a slight variation in the growth of plants in each lot became apparent. The unfertilized plants in lot I showed slow growth. The plants in the fertilized lots produced more leaves that were crisp, dark green in color, and fairly large, whereas the unfertilized lot had few, small, and light green leaves. Of the plants in the fertilized lots, those in lot II produced leaves that were relatively darker green in color. Maturity was apparently uniform in all the fertilized lots.

Yield of tops. On December 20, 1950, exactly 42 days after transplanting, the plants were harvested and weighed. Table 1 shows the comparative weights of lettuce tops of the plants in each lot. The analysis of variance (table 1b) proves that fertilized plants irrigated with 30 per cent of the water-holding capacity gave a significant difference in the weight of tops over the unfertilized plants irrigated with the same amount of water. Among the plants in the fertilized lots, there was an insignificant increase in weight of tops when the amount of water applied was increased from 10 to 20 per cent and an insignificant decrease when the water was increased to 40 per cent (table 1a).

Weight and length of roots. Table 2 shows the comparative weights of roots of the same plants. The analysis of variance (table 2b) shows that the plants in the fertilized lots, irrigated with the same amount of water as the unfertilized lot, produced heavier roots. As the weight of the tops increased, there was a corresponding increase in the weight of roots. The weight of the roots of the plants in the fertilized lots did not give any significant difference, as shown by the analysis of variance (table 2a).

In the comparative length of roots (table 3) of the same plants, there was no significant difference between the unfertilized and fertilized lots which were irrigated with the same amount of water (table 3b). However, lots II and III had significantly shorter roots than the other lots (table 3a). This may be explained by the presence of a more favorable situation pressure (Wilcox, 1930) which must have induced the production of more and shorter roots. In the unfertilized medium, the roots tended to grow longer, apparently in search of food or mineral and nitrogenous nutrients.

Insect pest. No insect pest attacked the plants in this planting.

Weather conditions. The observed weather conditions during the period show the additional water from precipitation.

Second planting

Growth and maturity of plants. Aglibut and Laudencia (1949) reported that the best yield of lettuce in unfertilized Los Baños clay loam was obtained when the plants were supplied with irrigation water ranging from 50 to 100 centimeters, or 20 to 40 per cent of the water-holding capacity (air-dry basis) of the soil. In their study reported in this paper, the writers found that previous to the fertilizer treatment, the plants in each lot showed slight variation in growth. The early variation in growth of the plants in every lot is attributed to the different amounts of water applied. As in the first planting, the growth was accelerated a week after each application of fertilizer. The marked increase in growth was attributed to the response of the plants to the fertilizer dressings. Four weeks after transplanting, the plants in lot V showed slow growth, whereas those in lots III and IV grew faster. The plants in lot I showed the slowest growth among the five lots. This was no doubt due to deficiency of food materials in the soil. As in the first planting, the plants in the fertilized lots produced more leaves that were crisp, dark green, and larger in size than those in the unfertilized lot, irrespective of the amount of water added to the culture media. Among the fertilized lots, the plants in lot II produced darker green leaves than those in the other lots.

Yield of tops. Knott, Andersen, and Sweet (1939) reported that a wide fluctuation of heavy rainfall occurring at the time the heads are mature for market produce leaves that are soft and puffy. The weights of the tops in each lot are shown in table 1. The analysis of variance (table 1b) shows that fertilized plants irrigated with 30 per cent of the water-holding capacity gave a higher yield than unfertilized plants irrigated with the same amount of water. The plants in lot V gave the lowest weights of tops, based upon the computed L. S. M. D. (table 1a). This decrease in weight may be due partly to the increased leaching and washing away of the fertility of the soil which resulted from the increased amount of irrigation water. Table 1 also shows that the yield of the lettuce plants in the second planting was relatively greater than that in the first planting. The favorable weather and even distribution of rainfall during the second planting proved beneficial to the plants despite the strong winds which occurred during the maturity of the plants.

Weight and length of roots. The fertilized lot produced significantly heavier roots than the unfertilized lot (table 2b). As shown in the computed L. S. M. D., the plants in lot IV had heavier roots than those in the other lots (table 2a). The analysis of variance of the data on root lengths of the different lots does not show significant differences (tables 3a and 3b).

Insect pest. A week after the first application of fertilizer, the plants were attacked by larvae of *Plussia* sp.[2] The insect pest was readily checked by constant picking.

Weather conditions. The rainfall during this period was lighter but more evenly distributed than that during the first planting. The longest period of rain occurred 13 days before harvest. The inclement weather, however, did not damage the cultures, as they were protected by windbreaks.

Third planting

Growth and maturity of plants. Dearborn and Hepler (1932) stated that the heavy application or withholding of water in hot weather at the time of maturity of the plants causes soft heads, tipburns, and bolting. The writers found that the growth of the plants in each lot was more or less similar to that of the second planting two weeks after the lettuce was transplanted. Two plants in lot II and three in lot V showed tipburn a week before harvest, apparently because of insufficient water in lot II and an excessive amount in lot V during several hot days. The plants at harvest had more and larger leaves than those of the first and second plantings.

Yield of tops. The plants were harvested at the same age as those of the first and second plantings (table 1). As in the first and second plantings, the analysis of variance (table 1b) shows that the weight of tops of the plants in lot IV (fertilized) gave a significant difference over those of lot I (unfertilized). The weight of tops of the plants in the fertilized lots did not give significant differences (table 1a).

Of the fertilized plants, those in the third planting given 20 and 30 per cent irrigations produced greater yield than the corresponding plants in the first, but not in the second planting (L. S. M. D. for any two treatment totals between plantings—193.44).

Weight and length of roots. The plants in lot IV produced heavier roots than those in the unfertilized lot (table 2b), but the differences among the fertilized lots (table 2a) were insignificant. Although the plants in the different lots did not have any significant variation in the length of roots (table 3a and 3b), those in lot II had the shortest, as in the second planting. Representative plants from each lot showing the roots at harvest time are shown in figure 2.

Insect pest. A week after transplanting, the plants were attacked by the same pest that attacked those in the second planting. The pest was also checked by constant hand-picking.

Weather conditions. Two weeks after transplanting, there was constant rain. The heavy rain and strong winds, however, did not do much damage to the plants. Although this planting received the

[2] The insect was identified by Dr. Silverio M. Cendaña of the Department of Entomology.

widest distribution of rainfall, 27 daily irrigations (the highest in the three plantings) were given. This was necessary because the frequent but light showers were not sufficient to meet the moisture needs of the plants.

Fig. 2.—The appearance of representative plants from the unfertilized (number 1) and fertilized lots (numbers 2 to 5) 42 days after transplanting. Numbers 1, 2, 3, 4, and 5 received irrigation equivalent to 30, 10, 20, 30, and 40 per cent, respectively, of the water-holding capacity of the soil (air-dry basis).

Water requirement of lettuce in Lipa clay loam fertilized with ammonium sulfate

According to Aglibut and Laudencia (1949), the water requirement of lettuce in unfertilized Los Baños clay loam can best be satisfied if irrigation water corresponding to 20 to 40 (50 to 100 cm.) per cent of the water-holding capacity (air-dry basis) is applied. The results of this study show that a correspondingly lower amount of water is required to produce a good quality crop of lettuce if ammonium sulfate fertilizer is applied at the rate of 5 grams each plant. With the conditions obtaining during the experiment, irrigation water ranging from 20 to 30 per cent of the water-holding capacity (air-dry basis) seemed sufficient to meet the necessary water requirement of lettuce. By increasing the amount of water from 30 to 40 per cent, the yield of lettuce decreased in the second planting (table 1a). This may be explained by the fact that some leaching and washing away of the fertility of the soil accompanied heavier irrigation.

Taking 20 to 30 per cent of the water-holding capacity as the necessary water requirement of fertilized lettuce plants, the equivalent total depths of water applied were: first planting, 39.4 centimeters to 59.2 centimeters; second planting, 41.2 centimeters to 61.7 centimeters; and third planting, 46.3 centimeters to 69.5 centimeters. Water was observed seeping through the drainage holes at the bottom of the containers ten days after beginning of treatment, when irrigation water corresponding to 30 per cent of the water-holding capacity was applied every non-rainy day, indicating that the soil

was over-saturated. It was evident that irrigation water equivalent to 20 and 30 per cent produced plants with heavier tops than the other amounts but did not give any significant difference except in the second planting. The significant difference in weight of tops and roots of the plants in the second planting may be attributed mainly to the different rates of irrigation and partly to the absence of heavy rains during the growing period.

SUMMARY

1. The lettuce plants grown on fertilized Lipa clay loam soil and irrigated with water equivalent to 20 and 30 per cent (1.8 and 2.7 cm.) of the water-holding capacity (air-dry basis) of the soil gave greater yield than those irrigated with 10 and 40 per cent (0.9 and 3.6 cm.).

2. The yield of the fertilized lettuce did not differ significantly when the water applied was from 10 to 40 per cent.

3. Of the fertilized plants, those in the third planting given 20 and 30 per cent irrigations produced greater yield than the corresponding plants in the first, but not in the second planting. The yields from the different treatments in this planting, however, did not show significant differences.

4. The water requirement of surface-irrigated lettuce fertilized with 5 grams (applied twice) of ammonium sulfate was satisfied when irrigation water ranging from 20 to 30 per cent of the water-holding capacity of the soil was used, followed by prolonged dryness after the application of fertilizer.

5. With rain falling within the critical period and the plants maturing for table use in 42 days, irrigation water ranging from 41 to 70 centimeters was needed to produce a good crop from the fertilized Lipa clay loam soil.

6. Lettuce plants irrigated with an amount corresponding to 30 per cent of the water-holding capacity of the soil and fertilized with 5 grams ammonium sulfate produced a greater yield of more vigorous and uniform plants than those in the unfertilized lot.

7. The fertilized plants supplied with water equivalent to 30 per cent of the water-holding capacity of the soil produced heavier roots than the unfertilized ones in the three plantings. Of the fertilized plants, those in the second planting showed significant differences in the weight of roots, with those irrigated with 30 per cent producing the heaviest. No significant differences in the weight of roots were obtained among the fertilized plants in the first and third plantings.

8. Neither the fertilized nor the unfertilized plants irrigated with the same amount of water showed any marked variation in length of roots. Of the fertilized plants, however, those in the first planting had significant differences in the length of roots, the longest having been produced by plants receiving 30 and 40 per cent of the water-holding capacity of the soil, air-dry basis. The heavy rain-

fall during the period, the heaviest in the series of the present experiment, might have considerably influenced this behavior.

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TABLE 1

Weights of tops of lettuce plants grown in Lipa clay loam fertilized with ammonium sulfate and surface-irrigated with varying amounts of water[a]

PLANTING	LOT NO.	WEIGHTS OF TOPS IN GRAMS										TOTAL WEIGHT	MEAN WEIGHT
		Plants											
		1	2	3	4	5	6	7	8	9	10		
												grams	*grams*
First	I	6.15	6.70	9.80	8.80	3.55	10.15	21.10	10.10	7.30	10.15		9.38
November 7, 1950,	II	38.45	63.50	33.80	43.20	91.10	52.10	58.10	43.70	59.40	50.00	533.35	53.34
to	III	73.15	43.25	37.40	33.20	68.25	51.40	57.85	68.10	95.60	62.55	590.75	59.08
December 19, 1950	IV	26.20	55.55	48.15	28.79	81.05	79.50	38.60	75.87	57.75	23.50	514.96	51.50
	V	43.51	52.30	58.75	31.42	31.81	32.11	56.12	45.14	93.92	16.13	461.21	46.12
	I	10.51	15.62	11.80	20.20	11.31	15.39	10.42	11.39	10.72	11.90	119.26	11.93
Second	II	68.70	56.49	50.45	49.28	61.25	57.99	67.51	75.00	30.89	46.40	563.96	56.40
November 24, 1950,	III	54.75	56.55	85.96	50.16	65.70	93.55	71.10	95.65	53.10	33.50	660.02	66.00
to	IV	78.05	67.95	58.10	85.80	92.61	79.13	92.76	46.65	55.95	27.91	684.93	68.49
January 5, 1951	V	56.30	32.50	53.56	60.70	39.05	46.95	26.71	30.45	46.25	75.00	467.47	46.75
	I	7.10	9.45	16.31	17.00	10.93	5.81	7.30	6.50	11.02	9.86	101.28	10.13
Third	II	52.51	29.54	100.20	71.03	108.75	60.50	60.12	48.53	29.71	38.62	599.51	59.95
December 9, 1950,	III	100.20	104.19	34.31	91.77	103.57	54.58	75.10	111.71	59.04	91.30	825.77	82.58
to	IV	71.11	49.63	119.12	49.15	97.27	28.61	82.70	71.70	107.52	50.09	726.90	72.69
January 20, 1951	V	53.16	39.70	48.71	20.13	33.17	86.30	74.17	61.08	92.21	53.03	543.66	54.37

[a] See table on page 306 for treatments given.

TABLE 1a

Analysis of variance of the effects of varying amounts of water on the weights of tops of lettuce plants treated with the same amount of sulfate of ammonia, lots II, III, IV, and V

SOURCE OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE .05	TABULAR F-VALUE .01	REMARKS
			FIRST PLANTING				
Total	39	15044.61					
Lot treatment	3	856.27	285.42	0.72	2.86	4.38	Insignificant
Error	36	14188.34	394.13				
			SECOND PLANTING				
Total	39	14316.00					
Lot treatment	3	2953.91	984.64	2.23	2.86	4.38	Significant
Error	36	11362.09	315.61				
			THIRD PLANTING				
Total	39	30816.90					
Lot treatment	3	4830.97	1610.32	3.12	2.86	4.38	Insignificant
Error	36	25985.93	721.83				

L. S. M. D.—Second planting, 7.52.

TABLE 1b

Analysis of variance of the effects of application and nonapplication of ammonium sulfate on the weights of tops of lettuce plants irrigated with water equivalent to 30 per cent of the water-holding capacity, lots I and IV

SOURCE OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE .05	TABULAR F-VALUE .01	REMARKS
			FIRST PLANTING				
Total	19	19727.81					
Lot treatment	1	16275.26	16275.26	84.85	4.41	8.28	Highly significant
Error	18	3452.55	191.81				
			SECOND PLANTING				
Total	19	18408.15					
Lot treatment	1	14621.07	14621.07	69.50	4.41	8.28	Highly significant
Error	18	3787.08	210.39				
			THIRD PLANTING				
Total	19	33508.38					
Lot treatment	1	26230.47	26230.47	64.87	4.41	8.28	Highly significant
Error	18	7277.91	404.33				

TABLE 2

Weights of roots of lettuce plants grown in Lipa clay loam fertilized with ammonium sulfate and surface-irrigated with varying amounts of water

PLANTING	LOT NO.	WEIGHTS OF ROOTS IN GRAMS										TOTAL WEIGHT	MEAN WEIGHT
		Plants											
		1	2	3	4	5	6	7	8	9	10		
												grams	*grams*
First	I	2.25	3.85	2.20	3.80	1.00	3.75	2.70	4.35	3.90	4.40	32.20	3.22
	II	6.75	11.03	6.37	0.80	15.69	10.28	9.19	7.92	9.05	8.74	94.82	9.48
	III	12.50	6.03	4.95	5.40	9.10	5.31	8.99	8.37	15.65	7.96	84.26	8.43
	IV	4.00	8.55	8.89	4.35	7.86	13.21	6.57	10.33	8.11	4.83	76.70	7.67
	V	7.39	9.31	12.05	5.38	6.13	6.51	12.44	9.32	15.95	3.35	87.83	8.78
Second	I	1.09	1.18	1.01	1.29	1.42	1.38	0.62	1.19	0.79	0.99	10.96	1.10
	II	7.59	6.67	5.57	7.15	6.70	7.79	8.45	7.07	3.59	7.16	67.74	6.77
	III	7.24	8.19	8.79	9.30	5.58	12.99	8.19	6.41	6.58	4.29	77.56	7.76
	IV	10.99	8.49	8.62	12.98	10.04	11.78	11.77	5.24	7.19	5.33	92.43	9.24
	V	9.70	4.63	6.12	10.39	6.69	5.29	2.72	2.19	2.91	10.10	61.74	6.17
Third	I	2.52	3.09	6.04	7.05	5.49	2.30	3.12	2.31	3.30	3.72	38.94	3.89
	II	11.65	25.89	27.38	16.95	27.99	11.60	14.26	9.69	5.85	9.18	144.00	14.40
	III	21.16	9.65	7.21	20.41	19.08	10.09	12.80	27.67	11.62	19.89	175.82	17.58
	IV	14.64	9.45	25.51	9.51	17.68	3.86	17.82	14.48	23.86	11.55	148.56	14.86
	V	13.49	7.58	11.71	5.58	8.40	29.35	15.72	11.15	18.65	9.04	130.67	13.07

TABLE 2a

Analysis of variance of the effects of varying amounts of water on the weights of roots of lettuce plants treated with the same amount of sulfate of ammonia, lots II, III, IV, and V

SOURCE OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE .01	TABULAR F-VALUE .05	REMARKS
			FIRST PLANTING				
Total	39	804.91					
Lot treatment	3	17.31	5.77	0.26	2.86	4.38	Insignificant
Error	36	787.60	21.88				
			SECOND PLANTING				
Total	39	269.30					
Lot treatment	3	53.83	17.94	3.00	2.86	4.38	Significant
Error	36	215.47	5.99				
			THIRD PLANTING				
Total	39	1883.30					
Lot treatment	3	107.82	35.94	0.73	2.86	4.38	Insignificant
Error	36	1775.64	49.32				

L. S. M. D.—Second planting, 1.11.

TABLE 2b

Analysis of variance of the effect of application and nonapplication of ammonium sulfate on the weights of roots of lettuce plants irrigated with water equivalent to 30 per cent of the water-holding capacity, lots I and IV

SOURCE OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE .05	TABULAR F-VALUE .01	REMARKS
			FIRST PLANTING				
Total	19	253.30					Highly
Lot treatment	1	135.52	135.52	20.56	4.41	8.28	significant
Error	18	117.78	6.59				
			SECOND PLANTING				
Total	19	273.79					Highly
Lot treatment	1	221.79	221.79	76.74	4.41	8.28	significant
Error	18	52.00	2.89				
			THIRD PLANTING				
Total	19	1383.77					Highly
Lot treatment	1	936.81	936.81	37.73	4.41	8.28	significant
Error	18	446.96	24.83				

TABLE 3

Lengths of roots of lettuce plants grown in Lipa clay loam fertilized with ammonium sulfate and surface-irrigated with varying amounts of water

PLANTING	LOT NO.	LENGTH OF ROOTS IN CENTIMETERS										TOTAL LENGTH	MEAN LENGTH
		Plants											
		1	2	3	4	5	6	7	8	9	10		
First	I	22.30	25.10	26.50	27.00	31.20	33.30	19.30	32.40	27.60	29.20	273.90	27.39
	II	23.20	23.35	20.05	25.40	27.60	23.50	22.90	23.50	23.50	19.50	233.10	23.31
	III	25.90	27.30	26.00	24.20	25.12	22.35	27.30	23.90	20.00	26.60	248.77	24.88
	IV	29.05	27.90	24.30	28.90	32.35	27.10	25.50	29.90	24.90	28.15	278.05	27.81
	V	25.72	24.10	33.50	23.81	19.30	30.31	37.00	27.31	32.85	26.25	280.15	28.02
Second	I	26.80	29.35	30.10	31.25	32.00	33.00	24.49	31.59	26.62	25.01	289.42	28.94
	II	28.25	25.70	21.98	25.90	24.40	31.70	25.90	27.25	23.70	24.22	259.79	25.98
	III	28.50	27.55	24.70	30.51	30.50	29.25	32.80	24.00	26.06	24.61	278.48	27.85
	IV	28.88	25.62	29.80	25.30	27.01	35.01	28.49	22.05	29.10	22.90	274.16	27.42
	V	31.69	22.79	26.49	27.59	29.30	29.12	28.09	25.08	29.70	32.79	282.64	28.26
Third	I	37.15	25.32	30.20	32.30	36.59	28.05	30.90	26.69	32.11	29.51	308.82	30.88
	II	28.80	29.85	32.50	24.90	24.60	23.30	27.32	22.10	27.35	29.71	270.43	27.04
	III	29.50	34.50	25.51	28.01	23.80	27.70	39.80	36.51	32.80	31.30	309.43	30.94
	IV	36.10	30.25	39.81	27.90	25.10	21.85	39.30	33.75	33.20	32.50	319.76	31.98
	V	32.01	28.29	35.31	28.15	29.49	28.04	34.10	29.60	45.29	32.31	312.59	31.26

TABLE 3a

Analysis of variance of the effects of varying amounts of water on the lengths of roots of lettuce plants treated with the same amount of sulfate of ammonia, lots II, III, IV, and V

SOURCE OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE .05	TABULAR F-VALUE .01	REMARKS
			FIRST PLANTING				
Total	39	613.30					
Lot treatment	3	158.15	52.72	4.17	2.86	4.38	Significant
Error	36	455.15	12.64				
			SECOND PLANTING				
Total	39	431.71					
Lot treatment	3	81.64	27.21	2.80	2.86	4.38	Insignificant
Error	36	350.07	9.72				
			THIRD PLANTING				
Total	39	856.09					
Lot treatment	3	158.20	52.73	2.72	2.86	4.38	Insignificant
Error	36	697.89	19.39				

L. S. M. D.—First planting, 1.61.

TABLE 3b

Analysis of variance of the effect of application and nonapplication of ammonium sulfate on the lengths of roots of lettuce plants irrigated with water equivalent to 30 per cent of the water-holding capacity, lots I and IV

SOURCE OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE .05	TABULAR F-VALUE .01	REMARKS
			FIRST PLANTING				
Total	19	256.30					
Lot treatment	1	31.57	31.57	2.51	4.41	8.28	Insignificant
Error	18	224.73	12.49				
			SECOND PLANTING				
Total	19	177.16					
Lot treatment	1	5.99	5.99	0.63	4.41	8.28	Insignificant
Error	18	171.17	9.51				
			THIRD PLANTING				
Total	19	361.69					
Lot treatment	1	0.02	0.02	0.001	4.41	8.28	Insignificant
Error	18	361.67	20.09				

PULSE RATE, RESPIRATION, AND BODY TEMPERATURE OF PHILIPPINE CARABAOS [1]

FAUSTINO S. MENSALVAS AND FELINO B. RIVERA

WITH ONE TEXT FIGURE

The very limited study of the normal variations in pulse rate, frequency of respiration, and body temperature of the carabao made by Ashcraft [2] lasted only for 20 days and was primarily designed for clinical diagnosis. Owing to the meager data on the normal pulse, respiration, and body temperature of the Philippine carabao, a study of these factors, which determine its state of health, and their seasonal variations, if any, was made in the Department of Animal Husbandry from May, 1950, to April, 1951. The period from January to May was considered as the dry season and that from June to December, the wet season.

MATERIALS AND METHODS

Twelve mature and apparently healthy Philippine carabaos (fig. 1), six males and six females ranging in age from five to ten years and belonging to private owners in the vicinity of the College of Agriculture, were subjected to the same care and management. They were tethered and watered daily and given salt regularly. No concentrates were given throughout the entire period of the experiment. For purposes of record, the males were numbered 1 to 6 and the females, 7 to 12.

The pulse rate, frequency of respiration, and body temperature of the animals were taken between 8:00 and 12:00 o'clock in the morning of every second and fourth Sunday of each month. The pulse rate was taken on the outer surface of the lower jaw just above the inferior border and timed with a stop watch for ten seconds at three different times. The average frequency multiplied by six gave the pulse rate a minute. To determine the frequency of respiration, three counts of one minute each of the rise and fall of the flanks were made with a hand tally counter, and the average was taken as the respiratory rate a minute. In determining the body temperature, a veterinary clinical thermometer graduated in degrees Fahrenheit was fully inserted into the rectum for three minutes. The temperature reading in degrees Fahrenheit was converted into degrees Centigrade.

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[1] Central Experiment Station Contribution No. 1629. From the thesis presented for graduation with the degree of Bachelor of Science in Agriculture, November, 1951, No. 1763.

[2] ASCHRAFT, J. B. 1921. A study of the normal variation in frequency of pulse, respiration, and temperature of carabao. Philippine Agriculturist **10**: 283–288.

Fig. 1.—Philippine male (upper panel) and female (lower panel) carabaos.

RESULTS AND DISCUSSION

Pulse rate. Table 1 shows the monthly mean pulse rates a minute of the twelve Philippine carabaos used in this study. The highest mean pulse rate of the males, 54.66 ∓ 0.212 a minute, was obtained in September, and the lowest, 53.50 ∓ 0.224 a minute, in November and December. In the females, the highest was 54.83 ∓ 0.307 a minute in September, the lowest, 53.16 ∓ 0.167 a minute in January and February. The mean pulse rate of the males was 54.02 ∓ 0.376 a minute, and that of the females, 54.12 ∓ 0.380, or a mean difference of 0.10. The difference was, however, insignificant.

Respiratory rate. As shown in table 2, there was little variation in the monthly mean respiratory rates of the animals. The lowest mean respiratory rate of the males, 22.00 ∓ 0.231 a minute, was recorded in October; the highest, 26.83 ∓ 0.602 a minute, was obtained in May. In the females, the lowest mean rate, 26.33 ∓ 0.494 a minute, was obtained in June; the highest, 28.16 ∓ 0.527 a minute, was obtained in May.

The females had a higher mean respiratory rate than the males, the mean rates being 24.56 ∓ 0.404 a minute for the males and 27.10 ∓ 0.177 a minute for the females. The mean difference of 2.54 was found to be significant.

Body temperature. The monthly mean body temperatures of the twelve carabaos varied slightly (table 3). In the males it was highest in May, 38.53 ∓ 0.071°C., and lowest in December, 38.32 ∓ 0.052°C. The highest reading in the females, 38.65 ∓ 0.069°C., was obtained in May; the lowest, 38.38 ∓ 0.041°C., in February. The mean body temperatures of the sexes also varied, the mean readings being 38.40 ∓ 0.018°C. for the males and 38.49 ∓ 0.022°C. for the females. The mean difference of 0.09 in favor of the females was, however, insignificant.

The mean pulse rate, frequency of respiration, and body temperature likewise varied slightly in individual animals. Animal No. 11 had the lowest mean pulse rate, 53.66 ∓ 0.224 a minute, and animal No. 7 the highest, 54.33 ∓ 0.344 a minute. In mean frequency of respiration, animal No. 1 had the lowest, 23.83 ∓ 0.600 a minute, and animal No. 9 the highest, 27.33 ∓ 0.384 a minute. The highest mean body temperature, 38.53 ∓ 0.076°C., was observed in animal No. 9; the lowest, 38.33 ∓ 0.103°C., was obtained from animal No. 2. The mean body temperature of all the animals used in this study was 38.52 ∓ 0.024°C.; the mean pulse rate was 54.16 ∓ 0.108 a minute. These figures are higher than the averages found by Ashcraft.[3]

Effect of season. The mean pulse rate, frequency of respiration, and body temperature of the animals were slightly higher during the dry season than during the wet season. However, when these were statistically treated, it was found that season had no influence (tables 4, 5, and 6).

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[3] *Ibid.*

Other observations. Two animals calved during the course of the study, animal No. 12 on July 15, 1950, and animal No. 11 on June 20, 1950. The calving, together with the typhoons that occurred on May 6 and August 14, did not have any apparent effect on the pulse rate, body temperature, and respiratory rate of the animals.

SUMMARY

1. A study of the pulse rate, frequency of respiration, and body temperature of twelve Philippine carabaos from May, 1950, to April, 1951, showed that the mean frequency of respiration of the females was significantly higher than that of the males, the mean rates being 27.10 ∓ 0.177 for the females and 24.56 ∓ 0.404 for the males.

2. There were no significant differences in the mean pulse rates and in the mean body temperatures of the two sexes. The mean pulse rate in both sexes was 54.16 ∓ 0.108 a minute, and the mean body temperature, 38.52 ∓ 0.024°C.

3. Seasonal fluctuations had no effect on the respiratory and pulse rates and on the body temperature of Philippine carabaos.

TABLE 1

Comparative monthly mean pulse rates a minute of male and female Philippine carabaos

MONTH	SEX	
	Male	Female
1951		
January	53.66 ∓ 0.212	53.16 ∓ 0.167
February	53.50 ∓ 0.340	53.16 ∓ 0.167
March	54.33 ∓ 0.220	54.50 ∓ 0.500
April	54.33 ∓ 0.220	54.66 ∓ 0.422
1950		
May	54.17 ∓ 0.166	54.33 ∓ 0.623
June	54.33 ∓ 0.422	54.50 ∓ 0.224
July	54.17 ∓ 0.306	54.17 ∓ 0.442
August	54.17 ∓ 0.166	54.50 ∓ 0.224
September	54.66 ∓ 0.212	54.83 ∓ 0.307
October	54.00 ∓ 0.365	53.33 ∓ 0.211
November	53.50 ∓ 0.224	53.66 ∓ 0.212
December	53.50 ∓ 0.224	53.66 ∓ 0.212
Total	648.32	649.46
Mean	54.02 ∓ 0.376	54.12 ∓ 0.380

Summary table comparing the mean pulse rates of male and female Philippine carabaos

SEX	NUMBER OF OBSERVATIONS	DEGREES OF FREEDOM	MEAN	SUM OF SQUARES
Male	12	11	54.02	1.8690
Female	12	11	54.12	1.9060
	SUM = 22	d = 0.10		S = 3.7750
	Pooled Variance = 0.1715	SX = 0.169		t = 0.591

TABLE 2

Comparative monthly mean respiratory rates a minute of male and female Philippine carabaos

MONTH	SEX	
	Male	Female
January	24.66 ∓ 0.567	26.50 ∓ 0.428
February	24.66 ∓ 0.335	26.66 ∓ 0.630
March	24.83 ∓ 0.380	26.66 ∓ 0.333
April	26.33 ∓ 0.333	27.33 ∓ 0.506
May	26.83 ∓ 0.602	28.16 ∓ 0.527
June	25.50 ∓ 0.563	26.33 ∓ 0.494
July	25.83 ∓ 0.602	27.50 ∓ 0.224
August	24.66 ∓ 0.364	27.50 ∓ 0.288
September	23.66 ∓ 1.430	27.16 ∓ 0.307
October	22.00 ∓ 0.231	27.50 ∓ 0.427
November	23.16 ∓ 0.603	27.00 ∓ 0.258
December	22.66 ∓ 0.395	27.00 ∓ 0.365
Total	294.78	325.30
Mean	24.56 ∓ 0.404	27.10 ∓ 0.177

Summary table comparing the mean respiratory rates of male and female Philippine carabaos

SEX	NUMBER OF OBSERVATIONS	DEGREES OF FREEDOM	MEAN	SUM OF SQUARES
Male	12	11	24.56	20.5538
Female	12	11	27.10	4.1402
	SUM = 22	d = 2.54		S = 24.6940
	Pooled Variance = 1.1224	SX = 0.432		t = 5.879

TABLE 3

Comparative monthly mean body temperatures in degrees Centigrade of male and female Philippine carabaos

MONTH	Male	Female
January	38.40 ∓ 0.072	38.50 ∓ 0.069
February	38.35 ∓ 0.048	38.38 ∓ 0.041
March	38.49 ∓ 0.046	38.46 ∓ 0.022
April	38.47 ∓ 0.070	38.50 ∓ 0.063
May	38.53 ∓ 0.071	38.65 ∓ 0.069
June	38.35 ∓ 0.092	38.44 ∓ 0.061
July	38.38 ∓ 0.078	38.43 ∓ 0.011
August	38.37 ∓ 0.043	38.53 ∓ 0.037
September	38.43 ∓ 0.034	38.49 ∓ 0.040
October	38.40 ∓ 0.074	38.54 ∓ 0.059
November	38.37 ∓ 0.083	38.61 ∓ 0.044
December	38.32 ∓ 0.052	38.43 ∓ 0.018
Total	460.86	461.96
Mean	38.40 ∓ 0.018	38.49 ∓ 0.022

Summary table comparing the mean body temperatures of male and female Philippine carabaos

SEX	NUMBER OF OBSERVATIONS	DEGREES OF FREEDOM	MEAN	SUM OF SQUARES
Male	12	11	38.40	.0435
Female	12	11	38.49	.0661
Sum = 22		d = 0.09		S = 0.1096
Pooled Variance = 0.4981		SX = 0.288		t = 0.312

TABLE 4

Seasonal fluctuation in the monthly average pulse rates of 12 Philippine carabaos

MONTH	SEASON	
	Dry	Wet
	a minute	*a minute*
January	53.4	—
February	53.4	—
March	54.5	—
April	54.5	—
May	54.3	—
June	—	54.4
July	—	54.2
August	—	54.3
September ...	—	54.8
October	—	53.7
November	—	53.6
December	—	53.6
Total	270.1	378.6
Mean	54.02	53.71

Summary table comparing the mean pulse rates of 12 Philippine carabaos during the dry and wet seasons

SEASON	NUMBER OF OBSERVATIONS	DEGREES OF FREEDOM	MEAN	SUM OF SQUARES
Dry	5	4	54.02	3.4440
Wet	7	6	54.09	2.2767
SUM = 10		d = 0.07		S = 5.7207
Pooled Variance = 0.57207		SX = 0.481		t = 0.146

TABLE 5

Seasonal fluctuation in the monthly average respiratory rates of 12 Philippine carabaos

MONTH	SEASON	
	Dry	Wet
	a minute	*a minute*
January	25.58	—
February	25.66	—
March	25.75	—
April	26.83	—
May	27.16	—
June	—	25.91
July	—	26.66
August	—	26.25
September ...	—	25.41
October	—	24.83
November	—	25.08
December	—	24.83
Total	130.98	178.97
Mean	26.19	25.56

Summary table comparing the mean respiratory rates of 12 Philippine carabaos during the dry and wet seasons

SEASON	NUMBER OF OBSERVATIONS	DEGREES OF FREEDOM	MEAN	SUM OF SQUARES
Dry	5	4	26.19	2.0843
Wet	7	6	25.56	2.8969
	SUM = 10	d = 0.63		S = 4.9812
	Pooled Variance = 0.49812	SX = 0.455		t = 1.112

TABLE 6

Seasonal fluctuation in the monthly average body temperatures of 12 Philippine carabaos

MONTH	SEASON	
	Dry	Wet
	°C.	°C.
January	38.48	—
February	38.36	—
March	38.47	—
April	38.48	—
May	38.55	—
June	—	38.40
July	—	38.41
August	—	38.45
September ...	—	38.45
October	—	38.47
November	—	38.44
December	—	38.37
Total	192.34	268.99
Mean	38.46	38.42

Summary table comparing the mean body temperatures of 12 Philippine carabaos during the dry and wet seasons

SEASON	NUMBER OF OBSERVATIONS	DEGREES OF FREEDOM	MEAN	SUM OF SQUARES
Dry	5	4	38.46	.0187
Wet	7	6	38.42	.0077
	SUM = 10	d = 0.04		S = .0264
Pooled Variance = 0.00264		SX = 0.033		t = 1.212

A PLOT TEST OF FOUR SELECTED STRAINS OF SERAUP KECHIL 36 [1]

VALERIANO C. CALMA AND FERNANDICO M. CUARESMA

From 155 isolated productive strains of Seraup Kechil 36 subjected to a plant-to-the-row test, four were finally selected. The objects of this study were to find the most productive of the four strains when grown on a larger scale and to study their important agronomic characters. The work was conducted from June, 1947, to February, 1948, in the Department of Agronomy, College of Agriculture, College, Laguna.

MATERIALS AND METHODS

One ganta each of Seraup Kechil 36 rice strains numbers 233, 372, 419, and 482, which were isolated by Alejandro,[2] and one ganta of stock seed for control were used in the study.

The lowland rice field of the Central Experiment Station, 2,250 square meters of clay loam, was divided into 15 rectangular plots, each with an area of 150 square meters. Three plots chosen at random were planted to each of the strains and the control.

The seedbed was prepared in the ordinary wet-bed method. The seeds of the four strains and the control were placed in separate gunny sacks, soaked in water for 24 hours, and then incubated for another 24 hours before they were sown in the seedbed on July 22, 1947.

The field where the seedlings were to be transplanted was prepared in the ordinary manner of a lowland rice field. In the transplanting on September 12, 1947, two to three seedlings were planted in each hill at a distance of about 25 centimeters from each other. All the missing hills were replanted two weeks after transplanting.

The plots were not watered after transplanting to allow the seedlings time to establish themselves in the soil. Four days after transplanting, the field was irrigated to give the plants a good start and to submerge the germinating weeds. As irrigation was dependent upon rainfall, the water was maintained with difficulty in the plots and the weeds threatened to interfere with the growth of the plants. Hence, weeding was begun one month after transplanting and continued until the plants were tall enough to cover the weeds. The pests were noted and, whenever possible, controlled.

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[1] Central Experiment Station Contribution No. 1630. From the thesis presented by the junior author for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, November, 1948, No. 1593.

[2] ALEJANDRO, S. M. Plant-to-the-row test of Seraup Kechil 36 rice. (Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, 1947. Unpublished).

Harvesting was done from January 23 to 24, 1948, when the majority of the plants in each plot had matured. The plants were cut about 50 centimeters above the ground with a "lilik" or scythe. Threshing was done by trampling the panicles on a mat laid on the ground. The palay was partially cleaned of trash in the field before it was placed in sacks and brought to the laboratory for air-drying prior to cleaning and weighing.

The remaining trash was removed and the grains winnowed by machine. The volume in gantas and the weight in kilograms were recorded before and after winnowing to get the volume and weight of the empty grains.

RESULTS AND DISCUSSION

Complete germination of the seeds was attained five days after the seeds had been sown in the seedbed. One month after sowing, the seedlings began to show slight differences in height and vigor. Strain 482 appeared to be the most vigorous of the four strains and the control. The seedlings of the four strains were more uniform in height than those of the control. The average height in centimeters of 20 seedlings of each strain and the control when they were 51 days old were: strain 233, 50.47; strain 372, 55.95; strain 419, 60.65; strain 482, 61.14; and control, 51.28.

The seedlings recovered from the effects of transplanting in five days. Only slight differences in growth and vigor of the plants were noted a month after transplanting. The plants of strain 482 appeared to be the most vigorous. Some of the plants of strains 372 and 419 and the control were bothered by weeds which germinated two weeks after the seedlings had been transplanted.

The most important pests that were observed attacking the four strains and the control were the rice stem borer, *Schoenobius incertellus* Walker, the rice bug, *Leptocorisa acuta* Thunberg, and the red rice weaver, *Lonchura ferruginosa jagori*. No diseases were noted.

All of the plants of strain 482 lodged at maturity. About three-fourths of the plants of strains 233 and 419 and the control lodged, whereas the plants of strain 372 lodged only slightly. The high degree of lodging of strains 233, 419, and 482 and the control was probably due to the typhoon which passed the locality on December 26, 1927, when the majority of the plants were in bloom.

There was not much variation in the flowering and maturity periods of the four strains and the control. Strain 233 flowered in 154.3 days; strain 372, 155.6 days; strain 419, 154.6 days; strain 482, 156.3 days; and the control, 154.3 days. The four strains and the control matured about 186 days after the seeds had been sown in the seedbed. Undoubtedly, the long dry spell after transplanting of the seedlings, followed by successive typhoons, prolonged the maturity period of the different strains and the control.

Strain 482, with a mean of 12.10, had the greatest number of bearing culms to a hill. The control, with an average of 8.50, had least. The differences in the mean number of bearing culms to a hill of the four strains and the control were not significant.

The four strains and the control did not differ significantly in height. Strain 482, with a mean height of 147.93 centimeters, was the tallest, and strain 372, with a mean height of 132.90 centimeters, the lowest.

The yields of the four strains and the control are shown in table 1. Each of the four selected strains gave a yield higher than that of the control. When the data were treated statistically, however, only strains 233 and 482 gave yields significantly higher than that of the control. The increase in yield of strain 233 over the control was 24.41 per cent, and that of strain 482, 38.96 per cent. The fact that strain 482, which gave the highest average yield of 45.73 kilograms to a plot, gave a significantly higher yield than strain 372, the poorest of the selected strains, is also worthy of note. It will be recalled that all of the plants of this strain lodged at maturity because of the increase in weight of the panicles.

On the basis of 44 kilograms of palay to a cavan, the computed yield in cavans of every hectare of strain 233 was 62.01; strain 372, 56.21; strain 419, 59.33; strain 482, 69.28; and the control, 49.84.

The computed percentages of empty grains in each strain and the control were: strain 233, 6.7; strain 372, 6.2; strain 419, 6.8; strain 482, 5.8; and the control, 7.7. The fact that the highest yielding strain, strain 482, had the lowest percentage of empty grains is a merit in its favor.

SUMMARY AND RECOMMENDATION

1. The four strains and the control produced practically the same number of culms to a hill, ranging from 8.50 to 12.10. They flowered 154.3 to 156.3 days and matured 186.0 to 186.6 days after the seeds had been sown in the seedbed.

2. The yields varied from 32.90 to 45.73 kilograms a plot, or 49.84 to 69.28 cavans a hectare. Each of the four selected strains gave a yield higher than that of the control. Only strains 233 and 482 gave yields significantly higher than that of the control. Strain 233 gave an increase in yield over the control of 24.41 per cent, and strain 482, 38.96 per cent.

3. From the results of this study of the four strains, it is recommended that strains 233 and 482 be utilized for commercial planting.

TABLE 1

Comparative yield, in kilograms, of clean palay of the four strains and the control

STRAIN NUMBER	PLOTS			TOTAL	MEAN
	1	2	3		
233	35.8	45.2	41.8	122.8	40.93
372	34.7	34.0	42.6	111.3	37.10
419	36.7	42.2	38.6	117.5	39.16
482	47.7	41.3	48.2	137.2	45.73
Control	31.5	32.0	35.2	98.7	32.90
Total	186.4	194.7	206.4	587.5	
Mean	37.28	38.94	41.28		39.16

Analysis of Variance

SOURCES OF VARIATION	DF	SUM OF SQUARES	VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Strain	4	269.36	67.34	5.19	3.84	7.01
Plot	2	40.39	20.19	1.55	4.46	8.65
Error	8	103.81	12.97			
Total	14	413.56				

L.S.M.D. = 6.779

PALATABILITY AND CHEMICAL COMPOSITION OF SOILAGE OF SUGAR CANE SEEDLING NO. 199 AND NAPIER GRASS [1]

DONATO C. AZMAN

The work to determine the comparative palatability and proximate chemical constituents of Sugar Cane Seedling No. 199 and Napier grass was conducted from July, 1950, to September, 1951, in the Departments of Agronomy and Animal Husbandry. The chemical analysis was performed by Mrs. Mamerta M. Ylagan of the Department of Agricultural Chemistry.

MATERIALS AND METHODS

The two forage plants used were Napier grass (*Pennisetum purpureum* Schum.) and Sugar Cane Seedling No. 199, one of the seedlings selected by Calma and Samonte [2] from a cross between POJ 2878 and P.S.A. 14.

Five mature Philippine steers, namely, Bilukao, Darazo, Kalejon, Kamal, and Makisig, weighing from 387 to 545 kilograms, were used. The youngest was about eight years of age and the oldest about eleven. They were fed in boxes one meter long, 0.8 meter wide, and 0.7 meter deep, with partitions in the middle to separate the two forages. The boxes stood on legs 20 centimeters above the ground and were arranged two meters apart in rows.

The Sugar Cane Seedling No. 199 was harvested when two to three internodes were in evidence, and the Napier grass, when it was at the blooming stage. On the average, the interval between harvests was 4.3 months. At the time of cutting, 50 plants of each forage were taken at random and measured from the base to the tip of the longest leaf.

The forages were cut to about 30 centimeters in length and placed in the two separate chambers of the boxes, one box to one bullock. The bullocks were free to select the forage they wanted to eat.

The weight of the soilage given at each feeding time minus the weight of the leftover represented the amount consumed by each animal. Five feeding trials of 60 feedings for each animal were made.

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[1] Central Experiment Station Contribution No. 1631. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, October, 1951, No. 1749. Prepared in the Departments of Agronomy and Animal Husbandry under the direction of Associate Professor Valeriano C. Calma and Professor Valente Villegas.

[2] CALMA, VALERIANO C., AND HILARIO A. SAMONTE. 1947. Agronomic characteristics of (POJ 2878 × P.S.A. 14) F_1 sugar cane seedlings. Philippine Agriculturist **31**: 34–43.

Samples of the two forages for chemical analysis were taken during each feeding trial.

RESULTS AND DISCUSSION

Table 1 shows the average height of the plants at the time of harvest. In the five feedings of each forage, Sugar Cane Seedling No. 199 had an average height of 184.1 centimeters, and Napier grass had an average height of 245.2 centimeters.

Table 2 is a summary table of the comparative average amounts of the two soilages consumed by the different animals in the 60 feedings. Sugar Cane Seedling No. 199 was apparently more palatable than Napier grass in all cases. With Bilukao, the mean difference in the consumption of the two forages at each feeding was 2.12 ∓ 0.115 kilograms in favor of Sugar Cane Seedling No. 199. Kalejon consumed 2.72 ∓ 0.105 kilograms more of Sugar Cane Seedling No. 199 than Napier grass. Darazo's consumption of Sugar Cane Seedling No. 199 was 1.95 ∓ 0.118 kilograms greater than of Napier grass. With Kamal, the consumption of Sugar Cane Seedling No. 199 was 0.66 ∓ 0.118 kilogram more than of Napier grass. With Makisig, the mean difference was 2.12 ∓ 0.115 kilograms in favor of Sugar Cane Seedling No. 199.

The average proximate chemical analysis of Sugar Cane Seedling No. 199 and Napier grass at different cuttings is shown in table 3. Sugar Cane Seedling No. 199 had higher percentages of moisture, crude fat, crude protein, and invert sugar than Napier grass. On the other hand, Napier grass contained more ash, crude fiber, nitrogen-free extract, and lime. The calorific value of Napier grass was also higher than that of Sugar Cane Seedling No. 199.

Sugar Cane Seedling No. 199 had 7.33 per cent more moisture, 0.19 per cent more crude fat, 0.25 per cent more crude protein, and 0.76 per cent more invert sugar than Napier grass. Napier grass had 1.35 per cent more ash, 2.80 per cent more crude fiber, 5.26 per cent more nitrogen-free extract, and 0.11 per cent more lime than Sugar Cane Seedling No. 199. The calorific value for every 100 grams of the sample of Napier grass was 18.5 per cent greater than that of Sugar Cane Seedling No. 199.

SUMMARY

1. Sugar Cane Seedling No. 199 and Napier grass were harvested for feeding purposes at an average interval of 4.3 months. At that age, Sugar Cane Seedling No. 199 had an average height of 184.1 centimeters, and Napier grass, 245.2 centimeters.

2. As feed for work bullocks, Sugar Cane Seedling No. 199 was more palatable than Napier grass. The mean difference in consumption in favor of Sugar Cane Seedling No. 199 was from 0.66 $\mp$ 0.12 kilogram to 2.72 $\mp$ 0.11 kilograms a head at each feeding.

3. At the time of feeding, Sugar Cane Seedling No. 199 had higher percentages of crude protein, moisture, crude fat, and invert sugar but lower percentages of ash, nitrogen-free extract, lime, crude fiber, and calorific value than Napier grass.

TABLE 1

Average height of plants at time of harvest

NUMBER OF HARVEST	SUGAR CANE NO. 199	NAPIER GRASS
	cm.	*cm.*
First	256.7	247.9
Second	187.9	238.0
Third	130.1	247.5
Fourth	172.3	239.6
Fifth	173.4	253.1
Average ...	184.1	245.2

TABLE 2

Comparative average amounts of soilage of the two forages consumed by the different animals in the 60 feedings

NAME OF ANIMAL	TOTAL NUMBER OF FEEDINGS	SUGAR CANE SEEDLING NO. 199	NAPIER GRASS	DIFFERENCE IN FAVOR OF SUGAR CANE SEEDLING NO. 199
		kg.	*kg.*	*kg.*
Bilukao	60	3.6953	1.5776	2.1176 ∓ 0.115
Kalejon	60	4.2787	1.5585	2.7202 ∓ 0.105
Darazo	60	3.4674	1.5226	1.9448 ∓ 0.118
Kamal	60	2.2430	1.5518	0.6578 ∓ 0.118
Makisig	60	3.8888	1.7658	2.1230 ∓ 0.115

TABLE 3

Average proximate analysis of soilages of Sugar Cane Seedling No. 199 and Napier grass

SOILAGE	NUMBER OF SAMPLES	MOISTURE	CRUDE PROTEIN	CRUDE FAT	CRUDE FIBER	NITROGEN-FREE EXTRACT	ASH	LIME	SUCROSE	CALORIFIC VALUE FOR EVERY 100 GRAMS
		per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	
Sugar Cane Seedling No. 199	6	79.87	1.82	2.40	9.60	6.92	2.19	0.50	1.88	56.50
Napier Grass	6	72.54	1.57	2.21	6.80	12.18	3.51	0.61	1.12	75.00

AN UNDESCRIBED SPECIES OF MELANCONIUM ON TOMATO IN THE PHILIPPINES [1]

FAUSTINO T. ORILLO

In January, 1951, the writer observed that at least five per cent of the tomato fruits in the vegetable garden of the U. P. Rural High School, College of Agriculture, Laguna, were affected by a fruit rot. Fruits in all stages of infection were also observed in local grocery stores. Those which were severely infected were a total loss to the grower and to the retailer and those with slight infections, although salable, were very much reduced in market value. The fungus associated with the disease was isolated and tested for its pathogenicity to tomato fruits in the laboratory of the Department of Plant Pathology, College of Agriculture.

SYMPTOMS OF THE DISEASE

Under field and laboratory conditions, the tomato fruit is affected by the disease in all stages of its development. The lesions are flattened or slightly depressed, firm, brown to dark brown in color, and oval or circular in shape. The tissues bordering the lesions are discolored and slightly sunken and form a distinct narrow zone between the diseased and healthy tissues. The skin of the healthy portion of an infected fruit sometimes becomes yellowish, but in most cases it retains its normal color. As the lesions enlarge and attain a diameter of one-half inch or more, they become conspicuously marked with greenish-black, concentric bands composed of masses of conidia of the fungus. The diseased fruits either persist on the plant and eventually become mummified or fall of and deteriorate rapidly as a result of the combined action of the pathogen and other saprophytic organisms in the soil.

IDENTITY OF THE CAUSAL FUNGUS

The pathogen which proved to be the cause of the tomato fruit rot herein reported is a typical melanconiaceous fungus with characteristics of the genus *Melanconium* Link (Saccardo, 1884).[2] Ramsey and Link (1932)[3] reported a species of *Melanconium* causing tomato fruit rot, but these authors did not assign the fungus to a definite species. Dr. George F. Weber of the Department of Plant Pathology, University of Florida, in a personal correspondence with the writer,

[1] Central Experiment Station Contribution No. 1632.

[2] SACCARDO, P. A. 1884. Sylloge Fungorum. Vol. 3, 860 p. Ann Arbor, Michigan: Edwards Brothers, Inc.

[3] RAMSEY, GLEN G., AND GEORGE K. K. LINK. 1932. Market diseases of fruits and vegetables: tomatoes, peppers, eggplants. U. S. D. A. Misc. Pub. 121: 1–44. *Pl. 1–11.*

states that the disease is found in Florida and that it is caused by *Melanconium* sp. However, he has not mentioned the specific identity of the fungus. As the writer found that the characteristics of the Philippine tomato fungus do not fit any of the described species, *Melanconium lycopersici* sp. nov. is hereby tentatively proposed for it with the following description:

Melanconium lycopersici sp. nov.[4]

Fructus vulnera magna, firma, plana, lineis concentricis limosarum et viridarum-nigrarum mollium sporarum notata. Acervuli secreti aut aggregati, superficiales, circulis concentricis in vulneribus producuntur, non setuosi; 150.0 ad 257.5μ linea media, magnitudine solita 205.25μ. Conidiophores breves, erecti, hyalini, non septati, simplices aut ramis egentes; crebrissimi et frequentissimi; 2.0 ad 5.5 $\times$ 1.1 ad 2.8μ magnitudine, magnitudine solita 3.43 $\times$ 2.23μ. Conidia muris tenuibus, non septata aut continua, oblonga; hyalina juventute, paulum virida maturitate; nata singula apice conidiophoris; 3.6 ad 12.2 $\times$ 1.5 ad 3.3μ magnitudine, magnitudine solita 7.33 $\times$ 2.52μ; ordinarie productione tubi germinis hyalini utraque fine germinat.

Hab. Parasitic on green and ripe fruits of tomato (*Lycopersicon esculentum* Mill.). College of Agriculture, Los Baños, Laguna, Philippines.

Type specimens are deposited in the pathological herbarium of the Department of Plant Pathology, Los Baños, Laguna, Philippines. Specimens have been sent also to the herbaria of the Department of Plant Pathology, University of Florida; the Department of Plant Pathology, University of Wisconsin; and the Division of Mycology and Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. D. A.

[4] Latin translation by Fr. Edward Mooney, S. J., Ateneo de Manila.

COLLEGE AND ALUMNI NOTES

Mr. Iman Sumadi of the Ministry of Agriculture in Djakarta, Indonesia, was a campus visitor on October 5, 1951. He was on his way home from the United States, where he studied agricultural extension work. He conferred with the personnel of the Department of Agricultural Education and observed the projects of other departments of the College.

Mr. Valentin G. Cedillo, '42, of the Department of Agricultural Education, was recently appointed Supervisor of the Maquiling School.

Mr. Isidro P. Guico, stenographer in the Office of the Dean, passed the first grade (promotional) examination given by the Bureau of Civil Service.

The Zoology 1 class, composed of 205 students, went to Batangas, Batangas, on September 22, 1951, to collect marine specimens. The students were accompanied by Dr. S. M. Cendaña and Mr. P. J. Alfonso, Jr.

Students of the Luzonian Colleges, Lucena, Quezon, visited the College on October 6, 1951. They were given lectures on biology by Mrs. O. F. Sison and on vocational education by Mr. G. F. Saguiguit, both of the Department of Agricultural Education. Mr. Lamberto J. Tolentino, '47, accompanied the students.

The biology class of St. Joseph's Academy, Caloocan, Rizal, visited the College on September 22, 1951. The students were given a lecture on vanilla and black pepper culture by Dr. Pedro A. David of the Department of Agronomy.

The ROTC cadets of the Colleges of Agriculture and Forestry revived the Vanguard Fraternity in a meeting held on September 5, 1951. Cadet Lt. Col. Quirino Villaviza and Cadet Maj. Jose de la Cruz were elected commander and vice-commander, respectively. Lt. Lorenzo Balasoto, commandant of the local ROTC unit, is the adviser of the fraternity.

A parade and review was held in honor of the deans and faculties of the Colleges of Agriculture and Forestry and of the cadet sponsors on October 5, 1951. This was followed by a party at the Molawin Hall.

A regular scientific meeting of the Los Baños Biological Club was held on September 28, 1951, in the Agricultural Chemistry Hall. The following paper was read and discussed: "Stain of Sapwood of some common Philippine species used for soles of wooden shoes caused by Diplodia," by I. B. Siapno and E. F. Roldan.

Dr. Amando M. Dalisay, '37, was guest speaker of the Malolos Rotary Club at its luncheon meeting on September 29, 1951. He

emphasized that the amelioration of the rural community can be accomplished through strong community leadership. After the meeting, Doctor Dalisay was entertained in the homes of Messrs. Victor C. Aldaba, '21, Cenon Flor Cruz, '35, Francisco Tetangco, '38, Pacificio Bautista, '33, and José P. W. Tantoco, '33.

Mr. Eligio C. Ureta, '21, is the acting superintendent and Mr. Virginio C. Juan, the acting principal of the newly established Mindoro National Agricultural School.

Mr. Nathaniel B. Tablante, '46, instructor in agricultural economics, topped the government pensionado examination in agricultural economics given on August 4, 1951. Because he declined the award, Mr. Dimas A. Maulit, '28, of the Department of Agriculture and Natural Resources, who got second place, was sent abroad.

Dr. Nicanor G. Teodoro, '15, is with the Agricultural Development Branch of the PHILCUSA. He was formerly Dean of the Araneta Institute of Agriculture.

Mr. Diosdado D. Leyson, '41, is teaching in a private high school in Burgos, Malitbog, Leyte.

Greetings on the occasion of the Loyalty Day celebration were received by mail from the following alumni: Antonio P. Flores, '34, Cesario P. Bandong, '29, and Celestino P. Habito, '44. The last two are pursuing studies in agricultural education at the University of Minnesota.

Mr. and Mrs. Feliciano Cruz of the Central Luzon Agricultural College were campus visitors on October 31, 1951. They conferred with several faculty members concerning educational matters. Mr. Cruz is a member of the Class of 1941.

Mr. Francisco Manuel, who joined the staff of the College on October 1, 1951, got first place in the board examination for civil engineers. He graduated from the U. P. College of Engineering at the head of the class of 1951.

Miss Teresita L. Pronove, instructor in the Rural High School, resigned from her position, effective November 1, 1951.

Dr. F. M. Sacay of the Department of Agricultural Education was guest of honor and principal speaker at the inauguration of a rural reading center in Meycauayan, Bulacan.

The Laguna Medical Society held a scientific meeting on the campus on October 14, 1951. Among the discussion leaders was Dr. Antonio G. Tan, director of the College Infirmary. Dr. Mercedes B. Uichanco is the president of the society.

Students in the high-school department of Arellano University visited the College recently. They were accompanied by Mr. Ernesto P. Gabriel, '40.

Certificates were awarded to 130 public elementary and high-school teachers from different towns in Laguna, who completed a four-day course for scoutmasters and cubmasters, at a graduation program

held at the Rural High School auditorium on Saturday afternoon, October 20. The course was conducted by representatives from the Manila Office of the Boy Scouts of the Philippines.

The local troops of the BSP held an investiture and court of honor ceremony on October 19, 1951. Among those present were Dr. L. B. Uichanco, president of the Laguna Council, scoutmasters M. V. Jarmin and P. S. Fajardo, troop committee members, and school teachers from Laguna.

Dr. Felix K. Maramba, Jr., '48, returned recently from Australia with Mrs. Maramba. He attended the University of Sydney on a scholarship, majoring in chemistry.

Mr. Cenon Flor Cruz, '35, director of the industrial division of PHILCUSA, will spend six months in the United States, where he will make observation on the evaluation of industries at the Department of Commerce. He will also visit a number of industrial plants.

Mr. Jose V. Castillo, '37, former chief of the Agricultural Statistics Division of the Bureau of Census and Statistics, has joined the staff of the PHILCUSA.

Mr. Hector Rivera, '36, of the Credit Division of the Central Bank, visited the College recently and conferred with the personnel of the Department of Agricultural Economics concerning the plan of promoting the establishment of rural banks for farmers.

The number of College alumni was increased when the faculty, in a meeting held on November 3, 1951, approved to recommend to the University Council the graduation of the following students: for the degree of Bachelor of Science in Agriculture—Cipriano G. Ancheta, Quirino A. Anoos, Rufino D. Ayaso, Jr., Donato C. Azman, Marcelo M. Bartolome, Roland N. Caasi, Simeon L. Cadiz, Teodoro G. Cadiz, Daniel P. Caguioa, Sotero A. Calaustro, Patrocinio G. Dayrit, Roman R. Estioko, Jr., Vito F. del Fierro, Jr., Casimiro V. Guieb, Andres T. Lucas, Roman L. Lucas, Narciso M. Natividad, Adelino V. Ordoño, Rogerio A. Pablo, Felino B. Rivera, Mauro L. Ruma, Jaime A. Sandique, Jesus Torreta, Carlos G. Valdez, and Juan O. Villena; for the Certificate in Agricultural Education—Marcelo M. Bartolome and Vito F. del Fierro, Jr.; for the title of Associate in Agriculture—Cornelio O. Angeles, Esteban N. Basibas, and Matias P. Pilon.

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